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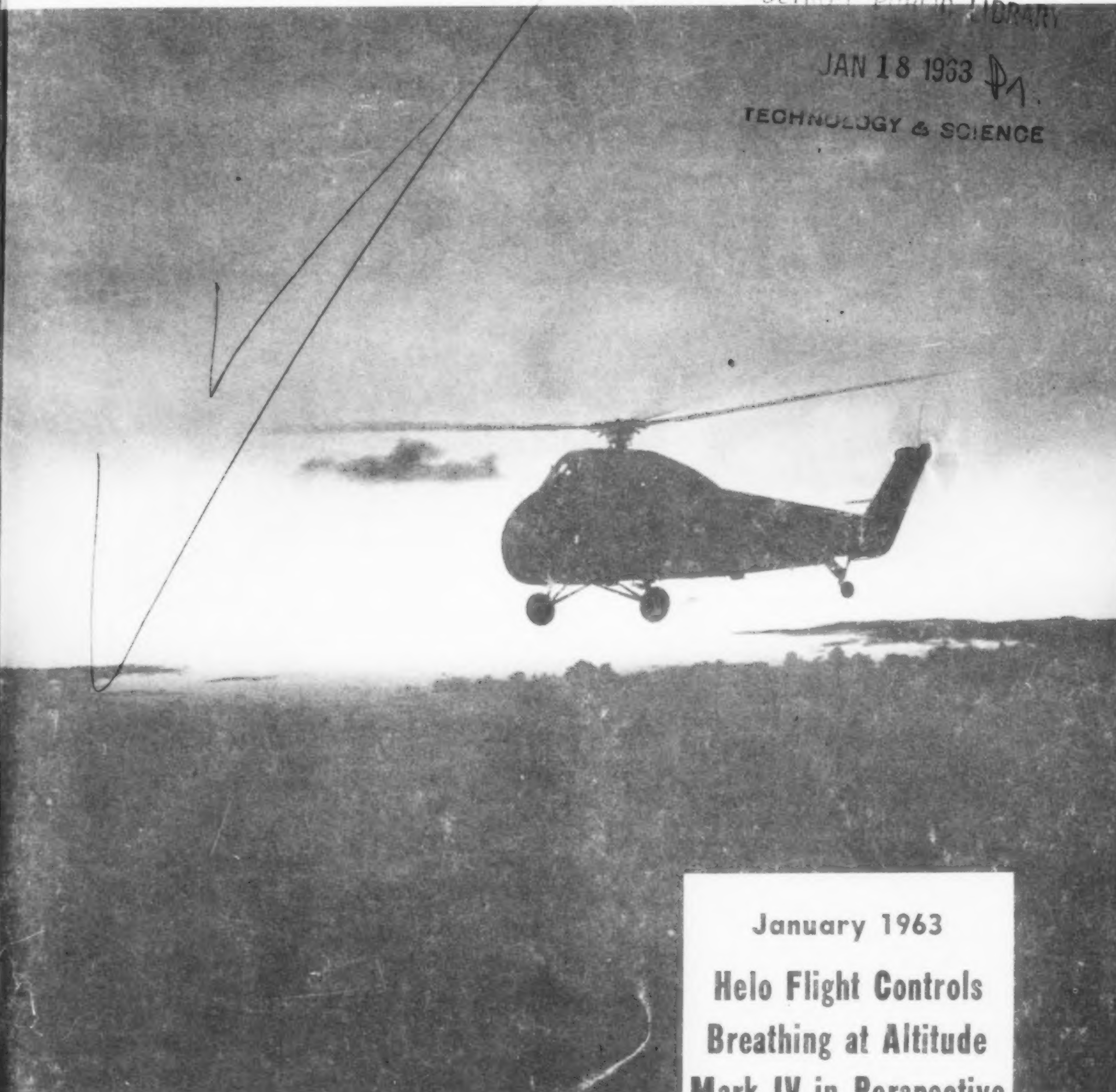
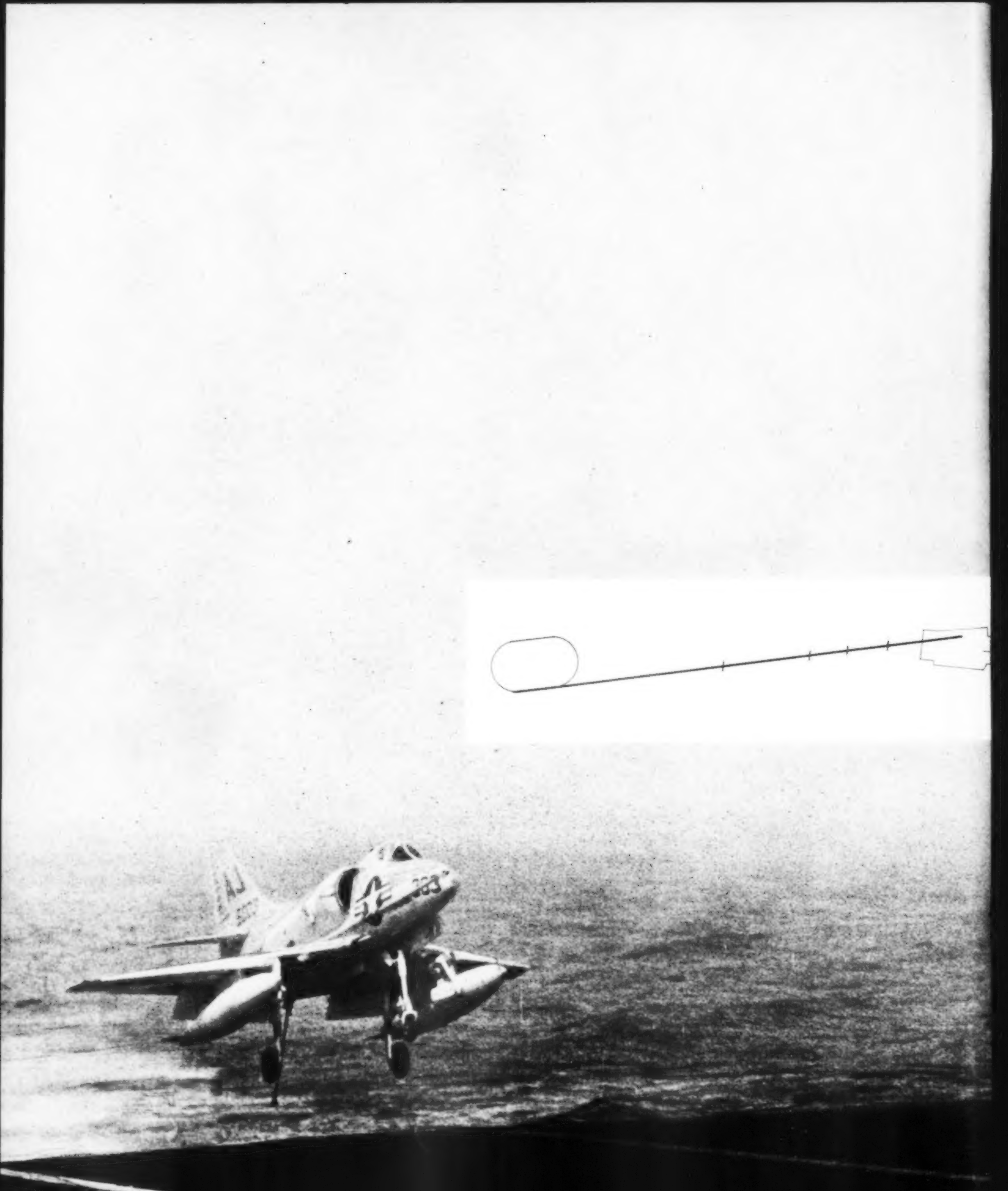
approach

THE NAVAL AVIATION SAFETY REVIEW



January 1963

Helo Flight Controls
Breathing at Altitude
Mark IV in Perspective
Lance Does It Again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By LCDR Martin Goode

the CCA Story

"Turn right ten degrees—centerline right—you're on glide slope, call the meatball—." These are words which identify the typically concise control used by the SARA's CCA Unit, which has helped in establishing a 72-second, per aircraft, ramp interval (including waveoffs and bolters) for night and IFR approaches to the SARA's flight deck. Pilot performance and confidence in the CCA personnel and procedures used, coupled with maximum use of equipment layout, design and capabilities, have given birth to a new era of night operational readiness on the part of SARATOGA and her Air Group.

26,000 CCAs

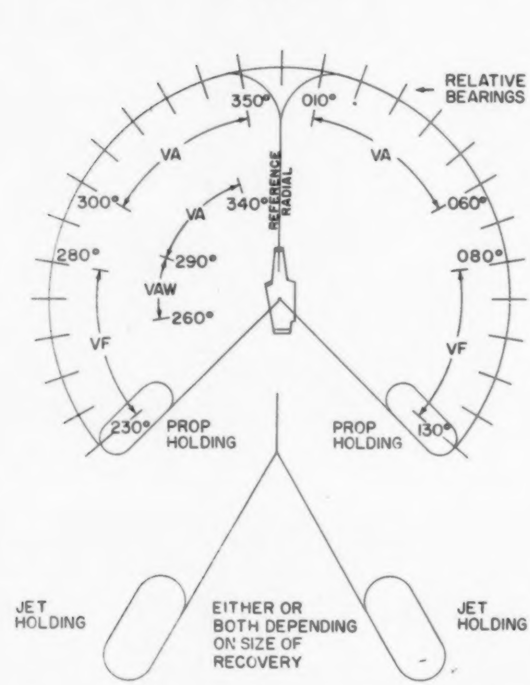
Twenty-six thousand CCAs have been performed aboard the SARATOGA, most of them by Air Group THREE pilots, and many of them devoted to the evaluation of new and untried procedures and techniques, investigated not only from a technical standpoint, but with a psychological approach to the problem of making possible a simple and successful carrier approach at night, or under IFR weather conditions.

At the inception of CCA, there were probably as many valid ways of conducting a CCA to a landing as there were pilots flying, and usually, each pilot's approach to the problem vaguely resembled whatever doctrine was in effect at that time. Unhappily, this was the result of a lack of understanding, on the part of both pilots and controllers, of each other's particular problems, capabilities and limitations. Fortunately, improved techniques, better equipment, intensified training and the advent of tranquilizer pills have yielded a much improved environment for the CCA program.

Air Group-CCA Relationship

A very important factor in establishing a well-knit Air Group/CCA relationship, is mutual respect for each other's views and capabilities. To lay the groundwork for this respect, predeployment briefings were conducted at the Air Group's home field, to educate

IFR/NIGHT CLIMBOUT·
DIAGRAM



pilots and controllers on important aspects of doctrine and related functions. Additionally, pilots are invited to the CCA spaces aboard the ship to view equipment and meet the crew. During the deployment, many bull sessions, as well as formal lecture periods are the order of the day, so as to determine possible weak points and eliminate them. These conferences play an important part in developing a feeling of belonging to each other, for each group. Though a division of the ship's company, the CCA crew quickly begins to associate itself with the Air Group, thus resulting in a friendlier and more cooperative atmosphere. This is very important if the CCA program is to be a success, and in its absence, no amount of lectures, criticism or detailed doctrine will improve the CCA work of the pilots or the controllers.

Basis of Doctrine

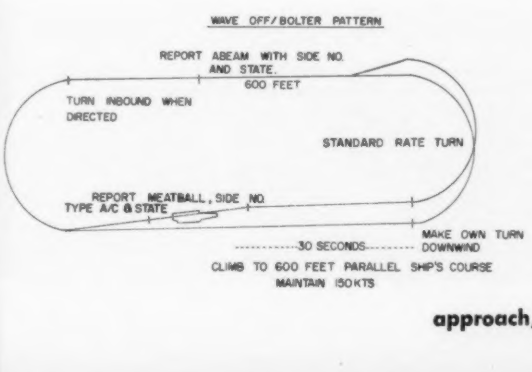
SARATOGA's doctrine, which is based on current ComNavAirPac/ComNavAirLant Instructions, includes detailed procedures for climbout and recovery during both VFR and IFR weather conditions. All jet procedures are based on Tacan and prop procedures on Tacan and low freq. Climbout procedures provide for "self control" by all aircraft except those not having this navigational aid. In order to accomplish this, each pilot, prior to manning this aircraft, is provided with a magnetic radial on which he will climb to his operating altitude. He follows definite altitude and speed restrictions after takeoff, to a specific point ahead of the carrier, at which time he is clear to "track around" to his assigned radial. Prop aircraft, likewise, are assigned definite radials and altitudes which are designed to minimize chances of interference with the jet pattern. Lineal separation is provided for by a minimum launch interval of 30 seconds per aircraft, and vertical separation by pilot adherence to preassigned altitudes. During VFR weather, of course, a more expeditious system prevails.

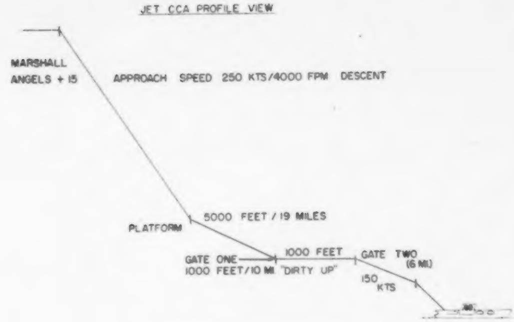
Recovery procedures are also based on ComNavAirLant/ComNavAirPac Instructions, and include such innovations as low altitude marshall for A3D aircraft, and a variable dirty-up distance for approaching aircraft "Dirty up" to SARA's pilots means—"drop the garbage and slow to 150 kts." This occurs somewhere between the Ten-Mile Gate and the Six-Mile Gate, and serves to more firmly establish the 60-second-per-aircraft ramp interval which SARA is noted for. Additionally, it makes child's play of creating intervals for bolters and waveoffs without disruption of the flow of traffic into final approach. It is also the most important factor in "making the ramp time" plus or minus 15 seconds.

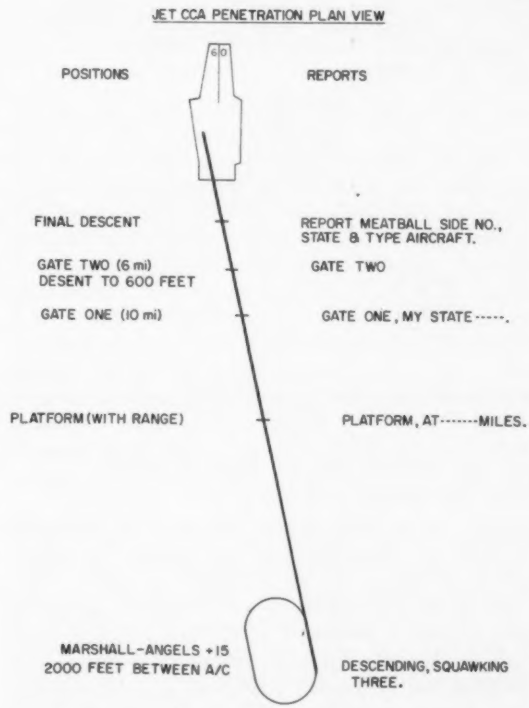
The official word for CATTC procedures is contained in ComNavAirLant P3710.-16E/ComNavAir Pac P3710.14 of 23 January 1962. While carrier standardization and the state of the entire art of carrier operations has come along way, there is still a long way to go. In the interests of stimulating discussion of this one phase—a particularly important potential accident area in view of increased night and all-weather ops— APPROACH *brings you what is believed to be one of the first comprehensive public discussions of techniques utilized by one carrier with considerable success.*

To illustrate this point, let us examine the jet approach which commences with a holding pattern on a given Tacan radial, *usually* aft of the ship 180° relative to Fox Corpen at a fix of "angels plus 15 miles." The first aircraft is marshalled at 18,000 feet/33 miles and is given an approach time of "ramp time minus 11 minutes," each succeeding aircraft following at one-minute intervals. Based on wind conditions, ship's Fox Corpen and pilot technique, the first aircraft will arrive at the Ten-Mile Gate at approximately 5 minutes prior to ramp time. The gouge on hitting the ramp time, plus or minus 15 seconds, is as follows: if the first aircraft is at 10 miles, exactly 5 minutes prior to the ramp time, he dirties at that time. If he is late at 10 miles, his dirty time is computed on the basis of 8 miles/4 minutes, 6 miles/3 minutes or appropriate interpolations thereof. Succeeding aircraft are dirtied when they arrive at a position three miles in back of the aircraft immediately preceding them, thus resulting in the 60-second interval. To make room for a "boltered" aircraft, a dirty-up 5 miles to the rear will result in a 120-second gap, thereby allowing room for the downwind aircraft to be turned in to Final Bearing, while still maintaining the integrity of the 60-second interval. The use of this method has resulted in the overall average of 72 seconds per aircraft, mentioned in the first paragraph of this article, as computed for approximately 6000 approaches to the ramp.

The prop Tacan marshall is a point 7 miles, 135 or 225 degrees relative to Foxtrot Corpen. Minimum altitude of base element is 3000 feet if jets are also operating. Aircraft below an overcast are not required to climb into an overcast to comply with the altitude limit specified above when CATCC can safely exercise control below the overcast. The holding pattern is a left-hand, six-minute race track pattern with inbound heading passing through the assigned fix if marshall is 225° relative; right turn if marshall is 135° relative. The prop ADF holding



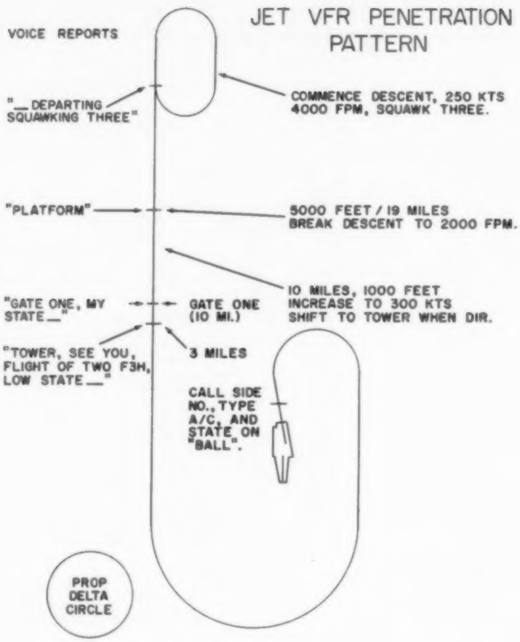




(including marshall) is left-hand, six-minute race track pattern ahead of the starboard beam with inbound heading passing through the assigned fix. Minimum altitude of base element is at 3000 feet if jets are also operating.

Emergencies

Emergency situations are divided into two categories: radio failure and any other kind. The thinking is that an aircraft possessing a usable radio can be controlled, regardless of his other difficulties, whereas an aircraft without radio requires definite procedures to follow in order to effect a safe recovery. In this event, the aircraft would proceed



to a prebriefed emergency marshall point at his preassigned emergency altitude, and commence holding, using "angels + 15" as his fix. He would squawk his IFF on I/P (Flash) position for 30 seconds every several minutes, signifying to the radar controller that a radio failure has been experienced, navaids are available, and that appropriate emergency procedures are being carried out. At this time the controller would vector an aircraft to attempt a join-up, and if successful, would bring both aircraft back to the ship together. However, if this is not possible due to weather conditions or other factors, the aircraft would commence a CCA to the ship, using the last known Fox Corpen as Final Bearing, at his prebriefed Approach Clearance Time, being well aware that the CCA controllers will keep other aircraft clear of his path. In the event that the aircraft has lost both radios and navaids, he would, of course, fly appropriate triangles, and await discovery using IFF as prescribed.

In connection with IFF procedures, SARATOGA follows those indicated in current publications, with slight modifications which are, presently, the subject of separate correspondence with higher level authority. These are as follows:

a. Aircraft squawk Mode 1 and 2 at all times (allows identification of squadron aircraft via Mode 2 code without use of radio).

b. Aircraft in penetration squawk Mode 1, 2 and 3. (Mode 3 indicates an aircraft in penetration to the ship for landing).

c. Aircraft with communications troubles, but good navaids, squawk Mode 1 and 2. Additionally, squawk I/P for 30 seconds every several minutes (allows quicker identification of distressed aircraft).

d. Aircraft with no radio or navaids squawk Mode 1 and 2 in triangle pattern. Additionally, squawk "Emergency" for 30 seconds every several minutes for immediate detection.

As is evident, the use of "Squawk Flash" and "Emergency" positions during appropriate circumstances, greatly enhances the expeditious and successful recovery of an aircraft in trouble, whereas, reluctance to use these devices can only lead to increased "time late" for discovery.

Frequencies Used

Communicationswise, two frequencies are used, concurrently, to control aircraft in their approach to the ramp from the marshall area. Alternate groups of two or three aircraft are controlled on each frequency and these aircraft do not switch frequencies at any time after departing the marshall area.

As might be expected, strict radio discipline is required in order to provide maximum air control with a minimum of confusion. As an additional safety fac-

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The unsung heroes of a smooth running CCA team are the electronics and radio maintenance crews.

tor, the LSO's transmitters are electronically designed to give him "transmitter control" whenever he broadcasts. This means that any transmission from a CCA controller will, automatically, be cut out, while the LSO's instructions are heard by the aircraft. One ARC-27, a separate "Guard" and a Land/Launch phone, round out the LSO's equipment. Information regarding landing order, state, frequency assignment, . . . are passed direct from the CCA room to Pri-Fly, LSO and Air Ops via the sound-powered circuits available, in this case the 1JG circuit.

Equipment Available

The CCA unit is fortunate to have the exclusive use of 7 individual pieces of radio gear to carry out its functions, and these are 5 TED-REDs, 1 GRC and 1 ARC-27. Since only 3 frequencies (2 Approach Control and 1 Departure Control) are in use, a triple back-up on each frequency is possible. In this manner, pilots are assured of dependable radio communications with their controllers, which is also conducive to confidence building for CCA work.

A very important feature of the internal layout of the CCA spaces is the equipment immediately available to the Supervisor (normally the CCA Officer) who completely controls the entire approach from his position. Four separate speakers enable him to personally monitor both approach frequencies, the Guard frequency and the sound-powered net, simultaneously. A URD-4 D/F is located immediately above his radar scope, for use in locating lost aircraft and the 19 and 21 MC boxes are within easy reach for conversations with the Conn, Flag, Air Ops, . . . Additionally, a direct sound-powered circuit (we call it the "heart line") is available for quick passage of information to the Captain, Pri-Fly and Air Ops. Of course, immediate access to any UHF frequency is available through his communications console, though it is used frequently, such voice communications being the responsibility of the controllers.

Control of the bolter pattern, as well as determination of dirty-up points, is also the responsibility of the Supervisor. Such information and instructions as are necessary between him and his controllers, is passed verbally, each controller raising his hand to signify receipt of the information. Though the noise level is somewhat increased with this method, it has the very decided advantage of enabling every man engaged in the CCA to keep a complete picture of the game, and split-second decisions are executed without delay.

Success Depends On Cooperation

Though it is recognized that the success of night operations depends, greatly, on cooperation between pilots and CCA, the real unsung heroes "of the cause" are the electronics and radio gangs. These men are constantly alert to imperfections in their gear, and are on immediate call to keep CCA in business. They are very much a part of the CCA/Air Group team and are instrumental in making possible the report that "all systems are go."

Constant CCA practice, together with frequent briefings and debriefings (similar to an LSO's debrief after a recovery) are a very necessary adjunct to the success of any night/IFR carrier operation. Standardization of voice terminology and flight procedures are accomplished only through daily review of approaches and playback of recorder tapes. The maintenance of a non-critical attitude on the part of both pilots and controllers creates a more pleasant learning environment for the absorption of CCA procedures. Furthermore, an on-the-spot recognition of professional accomplishment, by interested parties, does more than anything else to improve an already successful system of Carrier Controlled Approaches.

Standard Procedures?

Procedures, procedures, procedures—we all know them until they're coming out of our ears. How many times have you thought to yourself, "Same old jazz; everybody knows the procedures; let's go!"? Well, such is not always the case . . .

The weather hadn't been too good all day; it was up and down in fog and low clouds, but clear on top at 3000 feet. I was scheduled for a night hop and although I had little actual GCA experience, I'd be flying with the Ops Officer and I figured it would be no sweat—just a standard, section nav-instrument and GCA hop I'd flown a number of times VFR. Standard brief; standard procedures all the way. . . .

The lead rolled and I heard him call on top as I was timing my interval (one minute for a radar monitored climb to on-top). "No sweat," I thought as I cobbed my trusty A4D.

After a normal rendezvous and a few minutes of driving around, the leader had a trim failure, requested an earlier approach time and got it, along with ". . . 400 feet overcast, 2 miles in fog. . . ." Even though it was not standard squadron procedure, I asked to fly a section GCA and the leader agreed.

Turning on GCA final we got, "weather 300 feet and 2 miles in fog." I was glued on the wing nice and tight and things were fine until about 3 miles on final. "Four one three, move back and out, four one three, move back and out," came the instructions from the controller.

"Well, what the heck!" I thought. "That's standard in VFR but doesn't he know this is a section approach in instrument conditions?"

"413, move back and out."

"Better obey his instructions—power back—slip back a little. . . . oops! Lost the leader . . . better get on instruments . . . now no GCA info for me . . . 300 feet . . . better go around!"

I still had lots of fuel so I tried again. Weather was now reported as 200 feet and 2 miles.

"GCA, this is 413 on the waveoff, I think I have a gyro failure!" (Or was it a slight case of vertigo?)

"Roger, 413, I'll start and stop all turns," came the reply.

"Now wait a minute, he thinks I mean gyro *compass* but I'm talking about my attitude gyro. Well, better play it his way now."

The approach was erratic but as I approached minimums I saw the field momentarily.

"Wave off! Too far right of center!"

I rammed the throttle forward for the waveoff then suddenly thought, "Hey! I had the field in sight, therefore, the waveoff wasn't mandatory—or was it? Too late—back in the soup but plenty of fuel . . . try once more. . . ."

At this point the squadron CO, informed of 413's difficulties, interrupted my last approach from the GCA room and told me to divert, which was accomplished without further incident. I later learned that

the weather at the time of the divert was 100 and ¼ and actually went to zero-zero shortly thereafter.

It's obvious that there were at least two people in this incident who did not know or fully understand the procedures to be followed.

It was standard squadron doctrine to fly individual approaches under actual instrument conditions, fuel or aircraft status permitting. Why did I elect a section penetration and GCA under the most difficult conditions? When had I last practiced or briefed for one?

Why did the GCA controller tell me to drop back? Didn't he know the procedures for an actual instrument, section penetration? Why did I drop back? Didn't *I* know the procedures?

What does the standard term "gyro" mean to a GCA controller? What does it normally mean to a pilot? Why didn't GCA advise me when the weather was below single pilot's minimums of 200 and ½? Is it standard GCA procedures to keep a jet going around, with the field at or below minimums, without suggesting a divert?

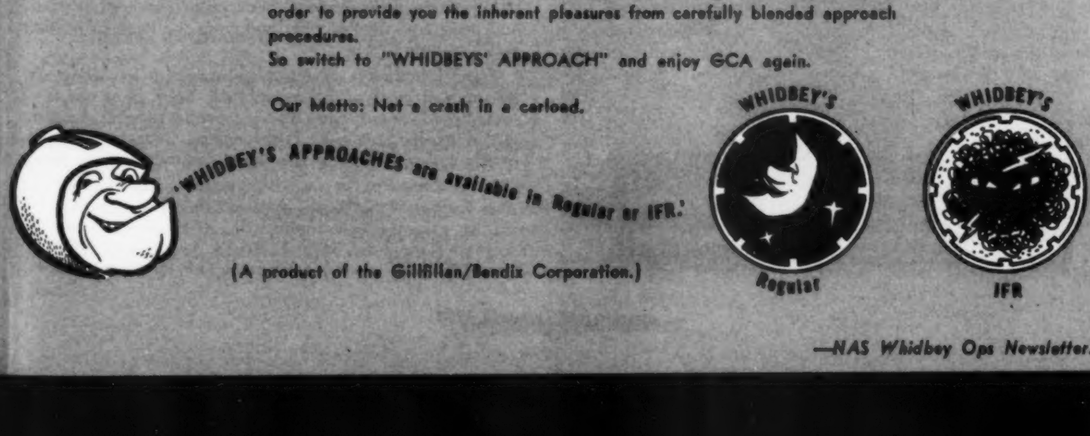
All these procedures can be found in the A4D NATOPS Manual, Squadron SOP or the Air Traffic Control Procedures Manual. Professional aviators, tower operators and controllers keep abreast of such publications and meticulously review safety rules and standard procedures; individually and in briefings and discussions. We all know them *COLD* . . . don't we? ?

Are you taking more GCA but enjoying it less?

Switch to "WHIDBEYS' APPROACH" for the cool satisfying enjoyment of smooth happy landing comfort. WHIDBEYS' filters the traffic over, under, around and through the fine patterns in order to provide you the inherent pleasures from carefully blended approach procedures.

So switch to "WHIDBEYS' APPROACH" and enjoy GCA again.

Our Motto: Not a crash in a carload.



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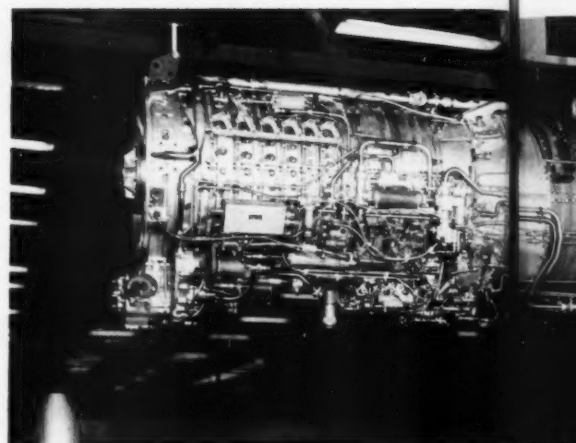
—*NAS Whidbey Ops Newsletter.*

READ 'EM OR WEEP

Ralph McCreadie,
Service Training School
General Electric Co.



Sound judgment is based on knowledge and the ability to apply this knowledge at the proper time, in the proper manner.

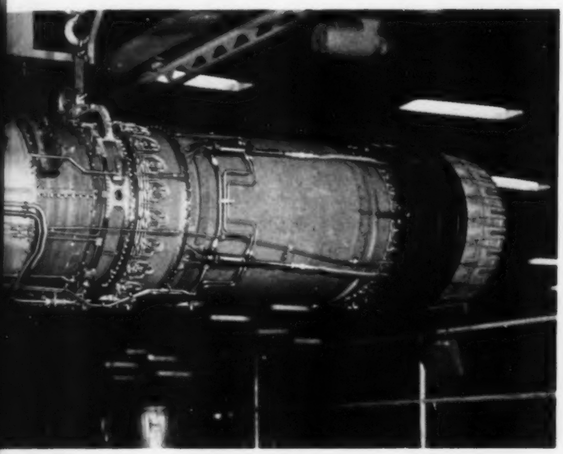
In pilot training, a working knowledge of information contained in the *Flight Manual* is necessary. Knowing what to do in an emergency as outlined in the manual has saved many lives and millions of dollars in equipment, and will continue to do so. One of the opening statements in any *Flight Manual* reads, in part, "This book provides the best possible operating instructions under most circumstances, but is a poor substitute for sound judgment." When an emergency occurs that is not covered in the manual, whether the pilot responds properly depends to a large extent on him as an individual.

The jet engine of today is a highly complex machine, yet an understanding of an engine's individual design philosophy is important. Each type of engine has its own characteristics. These characteristics must be understood by the operator in order to properly recognize, analyze, and correct a trouble.

A logical question, then, is, "What sources of information are available to a pilot who desires to gain a functional knowledge of an engine's operating characteristics?" Reading and understanding the *Flight Manual* should be his first source. Another source might be other pilots familiar with operating this type of engine. If the engine is new to the base and there are no experienced pilots, the local service representative should be contacted. He has been trained and is qualified to answer questions relative to his company's product. Usually, a proper indoctrination can also be obtained from the available special training programs and publications. Information concerning these publications and programs may be obtained from the base Education and Training Office.

Once knowledge of engine philosophy has been obtained and normal operation has been observed and understood, one of the more important trouble shooting aids available to a pilot is the engine instrument group in the cockpit. Among the more common engine gages are:

- Exhaust Gas Temperature
- Engine Speed
- Fuel Flow



- Variable Area Nozzle Position Indicator
- Exhaust Gas Pressure Ratio Indicator
- Engine Oil Pressure
- Engine Oil Temperature
- Aircraft Boost Pump Pressure
- Engine Air Inlet Pressure

The specific grouping of engine instrumentation found in a cockpit depends on the particular type of engine or particular manufacturer. However, regardless of the specific instruments which a particular application may have, those which are available are valuable tools which the trained operator can use to observe a problem, analyze it, and through sound judgment, take the necessary steps to correct it. In other words, engine instruments tell a story. If the pilot understands their language, instruments become an invaluable aid.

Engine instruments can be divided into two categories, thrust indicators and support system indicators. Included in the first group is engine speed. This is an indication of air flow and is useful in determining thrust. With a single spool fixed tailpipe configuration, engine speed can be used as a prime thrust indicator. However, an engine with variable stator geometry or a variable area nozzle can use engine speed as a thrust indicator, but must also use fuel flow and exhaust temperature in determining the final value of thrust. Still a third type, the dual spool configuration, may use engine speed, not as a prime thrust indicator, but as a reference point for establishing engine operating conditions. However, in all these different configurations, engine speed has a definite effect on thrust. Exhaust gas temperature also plays an important part in determining thrust output. When referenced to engine speed, temperature may be used as an engine condition instrument. Exhaust gas temperature too high or too low for a given engine speed will change the thrust output of the engine. Also, the exhaust gas temperature indication should be used to monitor the structural integrity of the turbine. In order to obtain design life from a turbine, conscientious monitoring of EGT is essential. This is particularly true during transient conditions.

Fuel flow is another important factor in determining thrust. The fuel flow indication, when compared with engine speed and exhaust gas temperature, provides another tool for realistic analysis of engine thrust output. Generally, changes in fuel flow result in changes in both engine speed and EGT. However, in the case of an engine equipped with variables, this is not necessarily true since air flow, which is one control of fuel flow, will be affected by variable IGVs, stators, and exhaust nozzles.

For example, if an engine's variable stators should fail closed at a high power setting, the reduced air flow would unload the compressor to such an extent that fuel flow requirements would be reduced. Assuming no throttle retard, the main fuel control would reduce fuel flow to schedule only enough fuel to maintain the selected speed. Exhaust gas temperature would remain high due to the overall fuel air ratio necessary to maintain the desired speed. The end result would be rated speed with a probable overtemperature, but fuel flow much too low in comparison with a normal engine. Such a condition would obviously result in low thrust. In other words, fuel flow is a directly related indication of engine air load. The fuel flow indication is also useful in establishing a cruise power setting.

Another thrust indicating instrument is the variable area nozzle position indicator, when used in conjunction with engine speed, exhaust gas temperature, and fuel flow. Knowledge of the relative position of the nozzle under various conditions of operation is useful in determining engine back pressure and, as a result, its effect on fuel flow, EGT, and engine speed.

A special thrust measuring device found on certain

READ 'EM OR WEEP | CONTINUED

types of engines is the exhaust gas pressure ratio indicator. This indicator system measures the pressure at the inlet of the engine and compares this in a ratio form to the pressure in the tailpipe. Studies of this relationship have shown that operation of a particular engine under a specific set of conditions with a given pressure ratio will produce a specific amount of thrust. This type of instrument is most applicable to an engine with a fixed or two position nozzle because its calculation of thrust is based on a specific pressure ratio across a specific tailpipe area. Due to the wide range of changes in area of a completely variable nozzle, a pressure ratio indicator is not useful in most engines with variable nozzles. In addition, this indication is also useful in determining cruise power settings.

Included in the support system indicators are engine oil pressure and engine oil temperature. Oil pressure is necessary for monitoring the lubricating and cooling qualities of the oil system. Engine oil temperature may be used to provide an indication of oil cooler operation on an application where engine oil is under heavy load.

Aircraft boost pressure, also a support system indicator, is sometimes helpful in determining the source of a fuel system problem and is generally included in the cockpit instrumentation group. However, it is often overlooked as an engine trouble shooting instrument. Under certain flight conditions, aircraft boost pressure is necessary to assure an adequate fuel supply to the engine fuel system. Monitoring the aircraft boost pressure may be of significant value in locating and correcting any problem associated with inadequate supply of fuel to the engine.

The last, although certainly not the least important, instrument included in the above list is the compressor inlet temperature gage. Its value as an indicator of engine performance increases considerably as engines become more and more complex and aircraft speed continually increases. Some engine control systems use compressor inlet temperature to compute schedules of engine speed, acceleration fuel, and other engine variables. In order to know if these schedules are correct, it is necessary to compare the CIT gage indication with other cockpit gage indications. The pilot must possess a working knowledge of the proper relationship between these indications in order to obtain maximum benefit from the CIT gage.

As mentioned earlier, these are the "tools" with which a pilot can analyze malfunctions and, through application of knowledge and sound judgment, make decisions and take action which could save his aircraft and, possibly, even his own life! Practical application of a few instrument uses in decision-making is included in the examples which will follow.

One of the more serious problems that may be encountered in any turbojet engine is compressor stall. Axial-flow compressor stall may perhaps best be understood by comparing it with stall as encountered on an airplane wing surface. Envision a cross section of the wing (air foil) in a head-on, smooth free air stream. The air foil is so designed with certain other considerations to allow smooth streamlined air flow over its entire surface. (See Figure 1.) As the angle of attack of this air foil is increased relative to the direction from whence the air is flowing, it becomes increasingly difficult to maintain this charcteristic smooth air flow. When the wing reaches a certain critical angle of attack, the air flow on the top of the air foil suddenly separates from the smooth streamline form and becomes rough and turbulent. (See Figure 2.) This imparts a high drag and resultant loss of lift to the air foil.

An axial flow compressor is made up of hundreds of small wings or blades and during a compressor stall this same happening occurs on portions of the blades of one or more of the compression stages. Since the blades are fixed, they do not physically move to different angles of attack. However, an increase of angle of attack, in effect, is caused by the decrease in air flow resulting from excessive fuel being injected into the combustion system for a given speed, such as happens

Figure One

during engine acceleration. In such a case, the increased rate of combustion causes a rise in combustion temperature which, together with the fixed area turbine nozzle diaphragm, effectively throttles the compressor discharge, causing a decrease in compressor air flow and accompanying increase in compressor discharge pressure. These effects occur because the compressor sees an effectively smaller area in the turbine due to the higher combustion temperature. If these changes in angle of attack are of sufficiently large magnitude, the blades stall, immediately causing a drop in compressor efficiency due to the increased drag and a drop in compressor pressure rise due to the loss in lift. When this action occurs, part of the compressor blading will be operating normally while the remainder will be operating stalled and thereby passing relatively little flow. Although this condition can persist in certain cases, the more normal occurrence is as follows: The pressure immediately downstream of the compressor is at a higher level than that which stalled portions of the blading are producing. A blowback of air results with the high pressure discharge air relieving itself by flowing forward through the stalled portion of the blades. The effect of this is to relieve the flow area of the unstalled portion of the blades. This then allows them to pump more pressure and move the compressor out of stall. The process then

repeats in a cyclic manner at a frequency largely governed by the volume of the inlet and discharge ducting. The cyclic phenomenon is known as pulsation. Combustion system instability and fuel control system characteristics play an important role in pulsation.

One of the best ways to detect stall in aircraft installed engines is to observe the tachometer and exhaust gas temperature indicator when making accelerations and decelerations. If the exhaust gas temperature continues to increase while RPM holds steady or falls off, the compressor has stalled and quick throttle retardance is required. In addition, a loss of thrust will be encountered, accompanied by abnormal engine vibrations and hissing sounds during the actual stall condition. In cases of violent stall, a "whoof" sound generally emanates from the engine air inlet often accompanied by flame. Violent shudders will occur, the exhaust gas temperature will climb to overtemperature values, and there is possible danger of engine damage.

For turbojet operation, instrumentation of the compressor discharge pressure would offer a much faster and more positive indication of stall than merely tachometer and exhaust gas temperature indication. This is

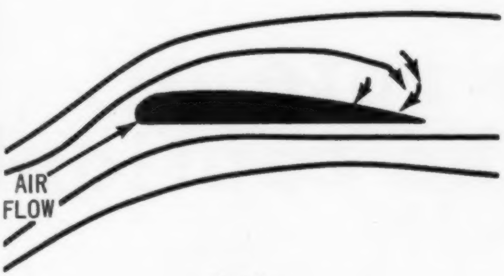


Figure Two

particularly true during accelerations and a stall condition would be indicated by a halt or decrease in the rate of compressor discharge pressure increase. However, this parameter is usually not included in a normal cockpit instrumentation group.

Since during stall engine RPM tends to fall off due to the resulting compressor drag, the main fuel control attempts to maintain RPM in the only way it can—by injecting more fuel into the combustion chambers. Aside from aggravating the stall condition by increasing temperature build-up, the resulting combustion causes temperatures far in excess of safe design limits and causes extensive damage to "hot parts" such as combustion liners, transition liners, nozzle diaphragm, turbine wheel and buckets, and exhaust cone. The sudden reversal of compressor air flow, as may occur during a compressor stall, can cause compressor blade bending and possibly compressor blade failure.

Today, as a rule, all production-type engines are designed and can be adjusted to prevent compressor stall, but it is that occasional "exception to the rule" which one must be alert to detect. When making throttle movements, follow recommended procedures, but *always* monitor engine instruments. Also, if a stall condition does occur, the *only* recommended way to recover is to retard the throttle quickly. Stalls encountered in flight can best be recovered from by following the procedure specified for the particular type of engine involved. Intensive investigation has been accomplished to assure that the procedure given is the best means available.

The more variables an engine has, the more attention must be given to the cockpit gages. An example is a single engine fighter equipped with a variable area nozzle and afterburner. In the event of a failed open nozzle, you should know the answers to the following questions: First of all, how serious a problem is it and what cockpit gages will reflect the open nozzle? Assuming that the airframe is equipped with a variable area nozzle indicating gage, it should indicate open. Even if it were inoperative and did not, other engine gages would give the indication. Fuel flow would be lower due to less back pressure. Thus, exhaust gas temperature would be a lower value. Exhaust gas pressure ratio would indicate lower. The result would be lower thrust. How much lower, and can you make it back to the base? What effect would this type of operation have on other engine components? Would attempting an afterburner light be of any value in this situation? Is there an emergency nozzle closure system? The answers to these questions and any others you may form should be known in advance of this possibility.

The lubrication system can also cause a pilot to make important decisions. For instance, he may be faced with such questions as: "How long will a particular engine endure and still produce power with zero oil pressure?" "What is the proper power setting for this particular engine that would give maximum engine life under this condition?" "Does any engine system other than the lubrication system require engine oil for its operation?" Once again, careful monitoring of cockpit gages will give the pilot a maximum amount of time to consider a problem and establish the proper corrective action. Don't end up saying, "The first thing I knew the engine was frozen."

Engines that use the engine oil supply other than to lubricate the bearings and gear boxes are becoming more common. Engine oil may be used to operate such components as a constant speed drive, a variable area nozzle; or perhaps, a variable engine inlet geometry. The engine oil supply on one particular fighter is contained in a single oil tank. Three pick up points are located at three different oil levels to supply three separate systems with engine oil. The three different levels of pick up establish a priority system; so that in the event of oil loss, the least necessary system will fail first. Recognition of this failed system and realization of its tie-in with other more important systems may give the pilot advanced knowledge as to possible future and more serious problems.

The main fuel system is primarily concerned with maintaining engine speed. Whenever a malfunction concerning engine speed occurs, the first thought should be: "Is the indication correct or could the engine speed indicator be at fault?" The answer to this question may be determined by observing other engine instruments, particularly fuel flow and exhaust gas temperature. If these indications are normal and only engine speed is abnormal, the fault may be in the indicating system; however, if these indications are also abnormal, the fuel control system should be suspected. To check the ac-

READ 'EM OR WEEP
CONTINUED

curacy of these indications, it should be determined if exhaust gas temperature is compatible with fuel flow. It is possible for the main fuel control to maintain desired engine speed even though abnormal indications exist. This condition may exist due to improper positioning of engine variables (i.e. stators, nozzle). In other words, these maladjustments may change fuel flow requirements necessary to maintain desired engine speed, and the fuel control system will regulate fuel flow accordingly. Therefore, any malfunction indicated by an abnormal gage reading of engine speed, fuel flow, and/or, exhaust gas temperature should be analyzed carefully so as to distinguish between causes and results. Even if inflight adjustments are not required, all abnormal indications should be noted and reported. Ground crew personnel depend on the pilot for a resume of the problems encountered in flight and the corresponding instrument readings taken at the time of fault.

The ability to understand the instrument language is one that is not easily mastered, but once learned, is another step in increasing the proficiency of any pilot. Cockpit instruments stand as instruments of direction. When an accident has been prevented, or a malfunction corrected, the diagnosis for corrective measure is usually based to a large extent on an understanding of the instrument language. ★ **AEROSPACE SAFETY**

You wrote the caption!

"This display prepared by O&R workers in off duty time from salvaged materials."

Anon.

Boy! Am I fed up!

Do I have to eat it all?

I was just hungry.

Hay! Ugh!

How come you do that, I said I wasn't hungry.

Heyday!

Just like morning after nite on Bourbon St.

You Said a Mouthful.

These cheap toothbrushes!

I'm not talking while the flavor lasts.

Man, this hay is the greatest.

Don't talk with a mouth full.

—NARTU NorVa Safety Office

"But the skipper said that I could grow one!"

"This is a heck of a way to take on Hay P-4!"

Martin Hall, ADR2, VT-27 NAAS NEW Iberia

"I ain't gonna eat hay like this again—next time I'm gonna try a bite of that dude that's ridin' me!"

A. S. Kalas, LCDR, NAS Miramar

"Smile, you're on candid camera."

M. H. Howard, AA, NAS Norfolk

"Oh no! and me with hay fever."

"Tell supply we know it's cheaper, but JP fuel still burns better."

"What do you mean, the Maintenance Officer is cutting expenses?"

VS-27, NAS Norfolk

"Look Maw! No cavities!"

M. T. Simmons, YN2, NAS Dallas

"Crunch-cious!"

L. B. Korosic, ATR3, VS-25

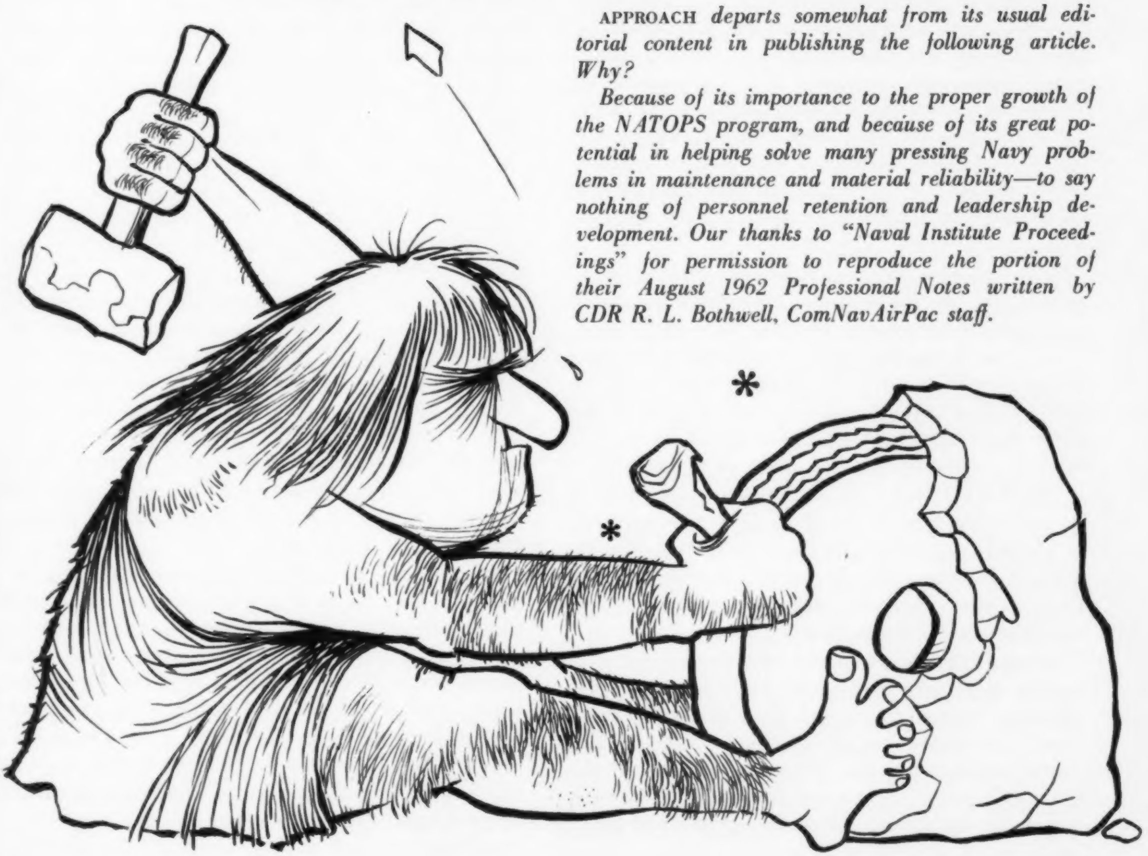
"Burp!"

"I knew that thing would never be a good crop duster."

VMA-225, MCAS Cherry Point

The Navy's Latent Resource

CREATIVE BRAINPOWER



APPROACH departs somewhat from its usual editorial content in publishing the following article. Why?

Because of its importance to the proper growth of the NATOPS program, and because of its great potential in helping solve many pressing Navy problems in maintenance and material reliability—to say nothing of personnel retention and leadership development. Our thanks to "Naval Institute Proceedings" for permission to reproduce the portion of their August 1962 Professional Notes written by CDR R. L. Bothwell, ComNavAirPac staff.

Tradition properly involves a continuity of customs and attitudes that add to esprit de corps. But when a particular operational method or procedure reaches the age of "tradition," hasn't the time also come to ask if there isn't a simpler, more efficient way to perform the task, or whether a new device would do the job better, or if modern technology suggests a different technique?

The lack of changing procedures suggests the universal existence of operating procedures that defy

improvement, a lack of creative brainpower, or a failure to encourage, accept, and put into effect new ideas.

The need for simple and ingenious ideas exists in the fleet today more than ever before. We cannot be like the patent clerk who resigned because he believed "everything that can be invented has been invented." Inventions propagate more inventions, and most of them have applications in modern sea power. Since the need clearly exists, let us examine the potential source of constructive thinking within our Navy.

About 80 percent of the 50,000 line officers in the Navy today are college graduates, some 30,000 of whom have degrees in engineering or scientific fields. Over 2000 have postgraduate degrees in engineering. Most of these scientifically trained officers perform administrative and operational tasks that support and operate the shore and sea establishments of the Navy. These are necessary jobs, often requiring long hours, but even the most demanding job does not preclude some time devoted to original thought. In fact, the operational job should serve as a catalyst for new ideas.

Some officers, despite their educational background, just do not have the capacity, ambition or the ingenuity to generate ideas or to research problems. Even if two-thirds of our scientifically-trained officers cannot or will not contribute, a force of 10,000 remains—trained, capable, and willing to improve the methods and operations of the Navy. Most are young officers—less than 10 years out of college.

The Navy includes about 290,000 highly trained enlisted technicians. It would be grossly conservative to assume that only 10,000 of them have the ingenuity and the drive to participate actively in a program of constructive ideas. A college degree is no prerequisite for brainwork.

These 10,000 select officers and the enlisted technicians could form the largest and most capable engineering service in the world. They exist today as the Navy's latent resource of creative brainpower. This talent must be stimulated, however, by an official program that provides personal incentive and assures reasonable opportunity for the acceptance and implementation of new ideas.

By incentive, I do not imply a Beneficial Suggestion Program that rewards ideas with dollars. This invariably attracts a mass of worthless suggestions. The high caliber of officer and enlisted personnel which must be inspired to original thinking requires only a climate of receptiveness and the impetus of recognized individual achievement. Pride in recognized accomplishment is the finest reward an intelligent man can receive.

A successful program to utilize the creative intelligence of the operational Navy must be fostered and vigorously supported at all levels. This support must include policy directives to provide individual recognition and action to reverse the present negative attitude of technical bureaus toward new ideas from the fleet.

A commanding officer should be required to forward the original work of a man in his command over the originator's signature, if such work is beyond the man's normal duty assignment. In the forwarding endorsement, the commanding officer should properly express his opinions or remarks. This changes the traditional practice, in which the creative work of an individual is normally incorporated in a letter "From: Commanding Officer with no credit to the real originator. This has been justified in the past by stating that the commanding officer assumes responsibility for the recommendation and that, in any case, the originator receives credit in his fitness report.

Suggested areas for operational or technical improvement should be listed periodically in order to stimulate thinking. A compilation of the most valuable recommendations should also be published frequently and disseminated to the fleet. Under the individual's name should appear a summary of his recommendation and the action that is being taken on it. Such a compendium would not only provide individual recognition but would also tend to prevent duplication of ideas.

The negative attitude in the various technical bureaus has been the final and culminating reason why our creative brainpower has remained a latent resource. I have seen numerous cogent ideas, with highly favorable endorsements from the fleet, summarily receive the coup de grace at bureau level. One such exasperating experience is enough to kill the inventiveness of any bright young man.

Why should such opposition come from technical bureaus headed by highly competent officers who are completely devoted to the needs of the Service? First, it must be understood that the various desks of a technical bureau are largely dominated by civilian specialisits. Correspondence forwarding a new idea is logically referred for action to an expert on the particular equipment or system which the idea pur-

ports to improve.

Understandably, but unfortunately, many people become defensive and hypercritical in such a situation. The expert's job description probably states that he originates, designs, develops, . . . And who is this young upstart to be telling him his job? (Can you imagine the reaction at the barrier arrestment desk, if in 1948 someone had recommended canting the landing area and thereby eliminating barriers?) Unfortunately, it must be conceded that many officers adopt a similarly defensive attitude when they serve in a technical bureau.

This condition must be eliminated. Technical bureaus should actively seek and sponsor new ideas from the fleet. Bureaus must be geared to implement recommendations that most certainly can be generated from the fleet's creative brainpower.

To obtain study or research of fleet problems, technical bureaus might well utilize the education and ability of officers with postgraduate degrees. The Navy invests heavily in sending selected officers to two- or three-year postgraduate courses in various fields of engineering. (Over 10 percent of all lieutenant commanders have completed at least two years of postgraduate engineering.) After this technical education ashore, the officer is due for sea duty. He spends the next two or three years aboard a ship or in an aircraft squadron—with little or no utilization of his advanced education. Specific research studies, which otherwise would never be made, could be assigned to individual officers with the pertinent education and in the opportune spot. Thus, for a study concerning antisubmarine warfare electronic equipment aboard destroyers, the Bureau of Personnel's machine records cards could quickly identify 18 officers with postgraduate degrees in electronics engineering and at least one more year on their present tour aboard a destroyer (217 lieutenant commanders alone have postgraduate degrees in electronics engineering).

As officer-in-charge of a small nuclear weapons delivery and loading school, I had the opportunity for one year to test the practicality of a program for constructive thinking. To the personnel of this small unit, I outlined the facts: "The Navy needs new ideas—you have the requisite brains and ability—pick a project and pursue it—you, as an individual, will receive full credit."

Most of the projects, as would be expected, applied to improvement of school training and changes to squadron weapons doctrine that could be readily implemented within the unit. Two of the developments, however, were of particular significance to all of naval air.

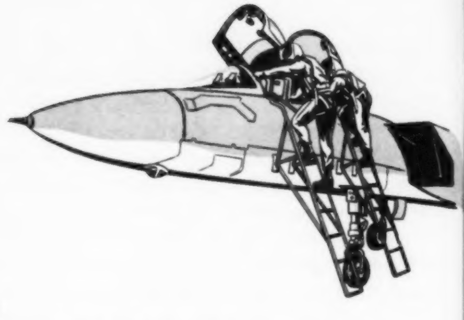
The first was the development of a small circular computer. On this computer (called the McComputer), a pilot can completely solve, in three or four minutes, the fuzing and delivery calculations of a nuclear weapon. This compares with 30 or 40 minutes required to use a bulky handbook, filled with charts and tables, requiring from 10 to 20 separate entries, inviting errors by similarity of figures and necessary interpolations. Pilot acceptance of the prototype computers was immediately enthusiastic.

Fleet squadrons requested these computers and Commander Naval Air Force, Pacific Fleet, had a sufficient number locally produced to supply a few to squadrons. But ultimate acceptance and fleet-wide use depends on the cognizant technical bureau—which referred the matter to its facility that produces the present cumbersome handbook. Initial correspondence from that facility (one year after the proposal) indicates that such a computer is not needed because: (1) excessive time required to checkout pilots in computer (10 minutes versus one day for handbook), (2) classified storage space is too limited for computers aboard ship (about 12 computers occupy space of one handbook), and (3) a new and simplified handbook is being designed.

The second development was a small aircraft weapons simulator developed by two enlisted technicians. It was called the MW Simulator. This electrical device (so small that it fits in the pylon of an A4D) provides the pilot with control and monitor indications of a nuclear weapon while he delivers a training shape or practice bomb on target. Enough of these simulators were made, from standard stock and surveyed equipment, to furnish each Pacific Fleet attack squadron with two MW Simulators (cost of equipment new, $32). Technical bureau approval?

This limited experiment indicates what can be accomplished by encouraging and abetting original work. Imagine the tremendous value that could be reaped by projecting such a program throughout the Navy. The ground rules are simple. Encourage, sponsor, and facilitate original thinking and constructive study—and then reward the individual with proper recognition. In the closely competitive struggle against a possible aggressor of about equal technical competence, the Navy can no longer fail to exploit its great latent resource of creative brainpower. ●

OP NOTES



Dim the Lights

Comment was made that the lights at the threshold of the runway are very distracting. It was proposed that a check be made with GCA and NAS operations to determine the feasibility of dimming the lights after runway contact has been established. The WV aircraft must be flared for a landing and after passing over this glare night adaptation is lost by the pilot.—*VQ-1*

Must Read Boards

Several members thought that the present system of all-pilots-read-boards left much to be desired. It was felt that safety items should be placed on a separate board. The safety officer maintains a read board but it has never been compulsory reading. The safety officer stated that in the future an initial sheet would be attached to all safety items that were mandatory reading.—*VS-21 Safety Committee*

Carry Minimum Equipment

The Group Maintenance Officer informed the committee that he had been collecting items of ground equipment from the taxiways and runways. He said that he believed most of it was being dropped off of vehicles towing aircraft to the turn up areas. He recommended that all squadrons conduct closer scrutiny of items carried to the turnup area to keep this at a minimum.—*Kaneohe Bay Safety Council*

SNB Heater Hazard

For reasons of weight and balance, the second seat on the starboard side of the SNB cabin has been removed. This leaves a relatively large area inviting stowage of baggage, survival equipment, etc. A cabin heater vent is located in this area creating a fire hazard.

At one station the unauthorized stowage of a mae west in this area resulted in one of the CO_2 bottles exploding and hurling bits of shattered cartridge holder around the cabin.

This problem will continue to crop up during the winter season. It is a good habit to check to see that this area is clear when entering the SNB and again before turning on the cabin heaters. As a further safety precaution, it is recommended that an appropriate sign of warning be stenciled next to the vent to remind occupants of this hazard.—*NAS Seattle Safety Council.*

EXCERPTS FROM SOME OF THE NAVY'S SAFETY COUNCILS THROUGHOUT THE WORLD, WHO PROVIDE LOCAL LEADERSHIP AND EMPHASIS TO THE NAVAL AVIATION SAFETY PROGRAM.

No Approach Light Procedure

The problem of gear-up landings at night was brought before the Council. A policy of requiring a waveoff and visual check of the gear by the LSO, fuel and weather considerations permitting, for any aircraft without an approach light was adopted as *standard procedure.—CVG-5*

Low Freq Nav Aid

Pilots are losing the ability to navigate on low frequency airways. Although most of these navaids have been decommissioned, there are still some around. You could be directed to use one during an IFR flight, so give the low freq nav aid a whirl when you have the opportunity.—*NAS Seattle*

Flight Planning Facilities

There is a definite need for standardization of flight planning facilities, equipment and publications within each Base Operations Office. Standardization would lead to better flight planning inasmuch as the proper tools would be provided aircrew members and they would know exactly where to find needed information. Standardization can be achieved without the excessive expenditure of funds.—*CNABaTra*

Mirror Source Lights Too Bright for Night Operations.

The four outer source lights have switches installed to turn them off for night operations. The four remaining lights, if left at the level used during daylight operations, are still too bright. There is a rheostat on the power distribution panel, but due to the location of this panel a public works electrician must be called to adjust the brilliance of the source lights.

Recommendation: That a study be made to re-locate the rheostat so that it may be adjusted by the Runway Duty Officer.—*Kaneohe Bay Safety Council*

Tower Tune-in

Problem: Tower personnel not notified of aircraft returning to the field with an emergency.

Discussion: In some cases the tower has not been notified of aircraft returning to Kaneohe with an emergency. It is felt that the pilots are reporting the emergency to their respective squadrons by radio. The Station Operations Officer stated that it is imperative that the tower be notified so that the crash crew can be alerted and other landing traffic diverted from the field.

Recommendation: That all pilots declare their emergencies to the tower as soon as possible.—*Kaneohe Bay Safety Council*

Over the Mountains

SO that all pilots who might make cross-country flights over mountainous terrain might have the benefit of the Ferry Command's experience, the following section from VR(F)-31 Instruction 3710.1D is quoted:

Ferry Flights over Mountainous Terrain

a. *Weather.* Weather minima for ferry flights is contained in OpNav Instruction 3710.6 (Current Revision) and is considered adequate for all normal operations. However, special consideration must be given to planning flights over mountainous areas when the following hazardous conditions exist:

(1) Marginal weather without sufficient terrain clearance.

(2) Severe turbulence with high winds.

(3) Thunderstorms accompanied by severe turbulence and ice.

b. *Flights in marginal weather conditions*: In mountainous areas weather stations and air stations are located at elevations which are below the mean elevation of the terrain between stations. It is common to have VFR flight conditions existing at adjacent weather reporting stations without having visual flight conditions existing between stations. In the absence of knowledgeable weather forecasting data, the responsibility of maintaining visual flight rests solely with the pilot. When enroute and the ceiling is either known to be or is estimated to be less than 1000 feet above the highest mountain pass along the intended path of flight, an instrument or on-top flight is required. VFR flight should not be attempted through any mountain area, mountain pass, or canyon beneath the clouds when weather conditions prohibit clear vision through to a clear area on the other side. This condition will normally require considerably better than 1000 feet of ceiling and three miles visibility. No flight should be made in any canyon of a mountainous area that does not allow sufficient room to turn around.

c. *Mountain Wave and Clear Air Turbulence*: The most severe cases of clear air turbulence are usually found associated with either jet-stream or with a mountain wave caused by the deflected winds to the lee of the mountains. Lenticular (lens shaped) cloud formations are indicators of these conditions, and usually form just below the clear air turbulence. Severe up and down airflows on the lee sides of mountains can cause aircraft structural damage and in some cases can prevent flight through the area. Circumnavigate predicted areas, change when encountered, or better still, execute a 180.

d. *All pilots are directed to*:

(1) Execute a 180 when encountering thunderstorms, icing, lowering ceilings, or severe turbulence under clouds.

(2) Conduct no VFR flights in weather below 1000 feet of ceiling and three miles of visibility.

(3) File an instrument flight plan when the weather is questionable.

(4) Thoroughly review weather for high winds and the possibility of turbulence. When severe up and down drafts are indicated, plan flight over an alternate route or cancel.

(5) Fly on top when possible.

(6) Remain on airways.

(7) Always remember—DON'T PUSH THE WEATHER. ●

CHOPPER CONTROLS

Why do helicopter pilots fly the aircraft from the right side? Why does the helicopter's throttle grip turn in the direction it does and why is a twist-type throttle used?

Right-side Pilots

Many explanations have been offered as to why a helicopter pilot sits in the right-hand seat instead of on the left, as in conventional airplanes. Some explanations may have an element of logic, if not perhaps of truth. But the underlying reason behind it all is the fact that in those early developmental years of the helicopter, I had trouble being ambidextrous.

The first military helicopter manufactured by Sikorsky was the XR-4—a two-place, side-by-side machine. It had a single collective stick and motorcycle-type throttle grip, located between the two seats. This is a most important point; because if the pilot tried to change from one seat to the other, he had to change hands on the collective stick and throttle grip.

For many months, I had been flying the experimental VS-300 single-place helicopter with the collective and throttle on my left hand, and the cyclic in my right. However, I was such a slave to custom that, when a side-by-side aircraft like the new XR-4 was to be flown, I felt that the pilot should be in the left seat. Therefore, in preparation for the XR-4's first flights, I sat at my desk by the hour with a ruler in each hand, getting myself oriented to the idea of controlling the cyclic with my left hand and the collective with my right.

The photograph of the XR-4's first flight amply demonstrates how awkward this was, but once I became accustomed to it, I was not about to change seats, for this would have meant swapping hands and learning all over again. When it came time to check out my first Air Force students, I still had only a total of 50 helicopter flight hours with 35 of these in this type aircraft and wanted to keep the un-

by Charles (Les) Morris Ass't Vice Pres.—Field Service Mgr. Kaman Aircraft Corporation

certainties to a minimum. So I put the students in the right-hand-seat, and stayed in the left one myself, where I felt quite at home.

When those same students began to perform helicopter missions, they naturally continued to fly from the side where they had been trained. So the right-hand seat became the pilot's seat!

Open Throttle

Another question that has often been asked is why the helicopter's throttle grip turns in the direction it does. To quote from the Air Force's first helicopter pilot's handbook which I wrote in 1942: "Throttle is 'open' when grip is turned clockwise, as viewed from the top end of the pitch control lever." This still holds true 20 years later.

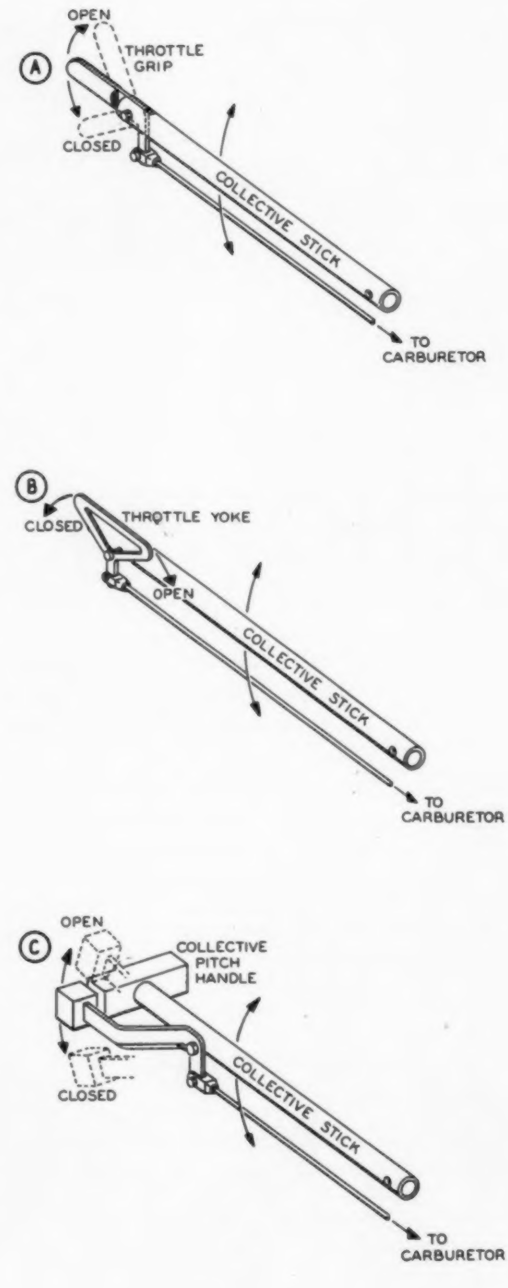
How was the decision made? Frankly, it wasn't a decision; it was an accident.

As I have said earlier in this article, I flew the XR-4 with my right hand on the collective stick, and therefore, the motorcycle-type throttle grip was also in my right hand. Experience with the experimental VS-300 helicopter had shown that, when we pulled in collective, we generally had to add some throttle even though we had partial synchronization between the two. Now, if you hold the collective stick (or a reasonable facsimile thereof, such as a ruler or a broomstick) in your *right* hand, it is a very natural motion to turn the grip *counter*clockwise (as viewed from the top) while you pull up on the stick. It becomes quite awkward, however, to turn it clockwise when pulling up.

So, when Bill Hunt, who was the project engineer on the XR-4 at that time, asked me which way the grip should turn to open the throttle, I told him it should turn *counter*clockwise. He assured me this would be done. But about a week later he reported that the engineers had found it necessary to put an extra linkage in the throttle control, with the result that the grip would now turn *clockwise* for open throttle.

He asked if this would be a serious drawback. I reflected for a minute on all of the guesses which had gone into the unknown factors in the XR's radical design, and decided that a matter as relatively minor as which way the throttle grip should turn was insignificant in relation to the others. I simply modified my armchair practicing so that my mind was re-tuned to this new and rather awkward method of opening the throttle.

As so often happens, it all worked out for the best: When the standard pilot's position shifted to the



right seat in the XR-4 so that the throttle grip was in his *left* hand, the awkwardness was automatically eliminated!

The Twist-Type Throttle

I don't recall who actually made the decision to design the XR-4 with a motorcycle-type twist grip for throttle control. Regardless of who made the decision, or why, experience has proved that it has at least one major drawback—there is no quick and positive way to "feel" whether the throttle is open or closed, except by relying on the pilot's habit patterns; nor is there a really good way to tell by feel how close you are to the full-open throttle position until you actually hit the stop. This drawback has been responsible for burning up innumerable engines due to starting with open throttle; and it has been a contributing factor to many accidents in which the pilot ran out of throttle at a crucial point without any advance warning that he was close to the stop.

Early in the game, we experimented at Sikorsky with another type of throttle grip (Sketch A) which gave very satisfactory results as long as the loads on the collective pitch stick were fairly light. If the collective stick was pushed down and the throttle grip pivoted down, everything was set for starting the engine, and for ground idling—low collective and closed throttle. For takeoff, the throttle grip was pivoted to a position just about in line with the axis of the stick, and this was the normal cruising position also. However, when high power was required, the grip was pivoted farther upward, and the pilot thus received an immediate "feel" that he was approaching the extreme throttle position.

This device had a couple of obvious drawbacks, one of which was quickly remedied by putting a flexible sleeve over the joint between the grip and the stick to prevent pinched fingers and hands. The other was the fact that, when pulling up on collective, the load had to be applied mostly with the little finger because it was closest to the pivot point; otherwise, the throttle grip had a tendency to pivot.

To overcome this latter problem, serious consideration was given to a design such as portrayed in Sketch B. I don't recall that this was ever tested, but it would obviously introduce another problem in that the throttle would be closed in the forward position and open in the rearward position—quite the opposite of conventional aircraft practice. Yet to reverse this design would introduce techniques that would be awkward to a helicopter pilot.

A third type of throttle which had much merit was introduced in the commercial Hiller 360, about 1949. It is shown in Sketch C. There was a comfortable square handle rigidly attached to the end of the collective stick, so that it resembled the letter "T." To the left of this was a smaller knob, with an arm going back to a pivot point on the collective stick.

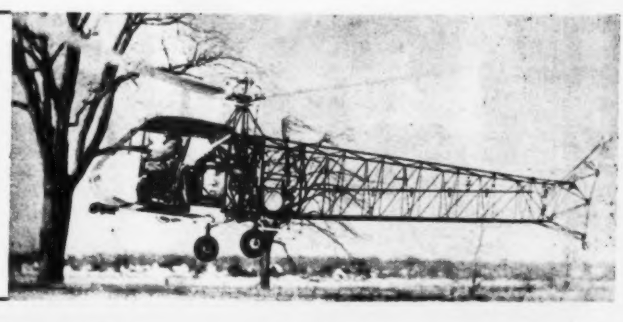
As with "device A," throttle was closed when the small knob was in the down position. When the small knob was just about even with the large handle, the pilot was in normal cruise position. When he began to approach maximum power, he would have to move the small knob upward relative to the handle, and the pilot thus received the "feel" warning that is so helpful in marginal operations. The small knob was operated by a kind of rolling motion of the pilot's hand, whereby his ring finger and little finger applied the light throttle control while his stronger fingers were reserved for the heavier loads of the collective pitch stick.

I flew many hundreds of hours with this arrangement, and found it to be quite effective. I even flew 400 miles cross-country one time with the airspeed indicator and the manifold pressure gage inoperative, simply using throttle position as my guide.

The design was discontinued in the interest of standardization, but I have always been sorry that a constructive forward step had to suffer this fate

—*"Kaman Rotor Tips"*

Mr. Morris, shown flying the XR-4, has been actively associated with helicopters since their pioneering days and, starting in 1941, served as Chief Test Pilot during the early development of Sikorsky helicopters. Included in the "firsts" to Mr. Morris' credit are the first helicopter flight to exceed 100 miles an hour, the first helicopter flight in America to exceed 5000 feet in altitude, the first helicopter night flight, the first true backyard landings, the first helicopter roof-top landings, the first actual landings of a helicopter without the use of engine power, the first in the world to hold a commercial helicopter pilot's license. He also initiated the first pilot and mechanic courses for helicopters and is the author of several books on helicopters.



NEAR MID-AIR COLLISION

The Story of

It was a clear, calm night,—the best visibility that home plate has had in a long time with 15+ visibility in an area that is usually lucky to have 5. No clouds were in the sky. Ideal Field Officers' flying weather!!

An approach was started by U-Bird No. 8 under RATCC Control. Vectors were given by the controller just as if the aircraft were under visual control. Perfect.

The descent was made by U-Bird to the step. Bogies were all over the sky, (it *was* Field Officers' flying weather). Controller ONE gives target info to U-Bird and to a few he TALLY HOS, to some he answers NO JOY, and once or twice he ROGERS (this is a game with the controller—when U-Bird ROGERS Controller ONE doesn't know what he means—I wonder if anyone does?).

Back on the ground the tower has just received a call from BIG BIRD THREE requesting a straight in approach to ole' rwy 34. He is approaching from the south VFR. They approve this and ask him to call at six miles (this approach is thru jet VFR-IFR approach lanes where two planes ticked wings earlier this year).

Now normally Tower One calls RATCC Center on VFR traffic, but there is some other difficulty on the field which distracts all the tower operators, so Tower ONE fails to tell RATCC of this VFR traffic.

In BIG BIRD THREE they are flying blissfully along. They know the VFR approach point, but are *dead* tired (almost true), and a straight-in will expedite the flight. They chug on up the slot across the jet approach corridor, and turn inbound to the runway. They let down from 4500 feet to the field and runway in a gradual descent. The approach looks good all the way down. BIG BIRD will be glad to be on the ground.

Meanwhile back on the step U-Bird receives his "30-second until descent" transmission plus some traffic info. "Target 10 o'clock, 3 miles." He takes a peek out and sees that little (BIG BIRD-THREE) beauty down there and TALLY HOS for him.

U-Bird's friend and ole' Controller ONE on the ground then says, "U-BIRD EIGHT TWENTY MILES SOUTH OF AIRPORT, DESCEND AND MAINTAIN TWO THOUSAND FIVE HUNDRED."

Controller ONE is talking a little faster now, but it's easy for ole' U-Bird to read and a "ROGER" is fired back at Controller ONE.

Controller ONE then gives U-Bird a turn that he ROGERS for.

Tension is building. The most challenging part of the approach is upon them. Controller ONE must cram 15 minutes of talk into $\frac{3}{4}$ of a minute and U-Bird must acknowledge, all the while doing a dozen other things.

Controller ONE then tells U-Bird eight about that traffic again, but U-Bird is very busy descending, turning and drawing a beautiful trace on the scope: so U-Bird throws another ROGER at Controller ONE—this causes Controller ONE to wonder, "Does he have the traffic?"

About this time U-Bird slows his descent, and is steady like a rock on heading, (this is the best

a Miracle...

(Mostly fact—very little fiction)

he's done yet). However, it is at this point when Controller ONE seems to revert to his native tongue and the following transmission is thrown at U-Bird in Chinese or some similar oriental language:

"U-BIRDEIGHTONEFIVEMILESSOUTHOF AIRPORT,PERFORMLANDINGCOCKPIT CHECKPREVIOUSLYISSUEDTRAFFICTWO O'CLOCKTWOANDONEHALFMILESNORTH-WESTBOUND"

U-Bird reacts to this rapid transmission with a NO JOY since he is transitioning to his landing condition and has many things to do and a hasty look is all he can spare if he is to check his descent, slow to approach speed, get the wheels down, the wing up, stay on course and altitude and ROGER or NO JOY for the transmission in the same period of time that his Chinese friend threw that transmission at him.

That Oriental comes back on the air with another machine-gun transmission:

"U-BIRDEIGHTTURNRIGHTHEADINGTHREE FIVEZEROONETWOMILESSOUTHWESTOF AIRPORTPREVIOUSLYISSUEDTRAFFICNOW ONEO'CLOCKONEANDONE-HALFMILES NORTHWESTBOUNDMAINTAINTWENTY-FIVEHUNDREDFEETSTANDBYFORFINAL CONTROLLER"

No reaction til this sinks in, then— — —

TRAFFIC ONE O'CLOCK ONE AND A HALF MILES—WHERE?—WOW! . . . THERE HE IS. . . . HIT BURNER AND JUMP OVER HIM —This jump is successful. In the Center, the blips merge.

A shook second later he tells his Chinese friend, "THIS is U-BIRD EIGHT. . . . I COULD HAVE HIT THAT "XI""X" TRAFFIC"

In the Center all stare in mortal fear as finally the blips separate and there is a sigh of relief—no

dripping blips that fall off the scope—no mid-air this time, but a close one.

P.S. All the ingredients needed for a mid-air collision were present and only a miracle had prevented a very messy wreck. Hair on the heads of controllers, pilots involved, tower operators, CO's, ASO's and CG's will not get grayer over this one.

Let's look back for a second — — — — — — — — —Basic errors were needed to give us this situation, and we may profit from them.

1. Air Operations Manual stated VFR Traffic enter over PT TANGO (we thought they were).

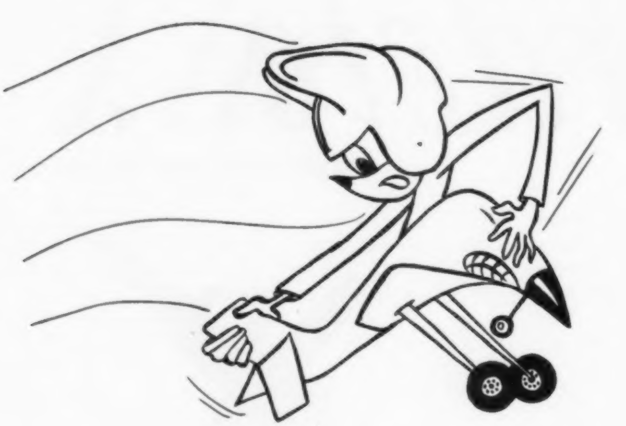
2. Single place aircraft in RATCC System VFR *are* responsible for the SEE AND BE SEEN rule —(this is very difficult to do and still fly a good approach, but you gotta' look. Failure to look may be fatal).

3. Add to the above a breakdown in passing information between RATCC Center and Tower, and the catalyst is added to the explosive mixture.

YOU NOW KNOW ONE WAY TO MIX A MID-AIR.

—Reprinted from third MAW's excellent bulletin "Hot Mike," to which APPROACH *staffers say "Welcome Aboard."*

Muscle Bound



AFTER completing a normal preflight inspection and checklist with no existing discrepancies, I was launched from no. 2 catapult for a scheduled night hop.

As the aircraft left the bow it began to climb abnormally (seemed to squat into a climbing attitude with the nose coming up and the tail dropping down) with a tendency to roll to the right and yaw to the left. I stopped and corrected the roll with ailerons but could get no response from, or movement toward full forward yoke. The nose continued up in spite of steady application of down trim. It seemed impossible the trim had runaway, but there was no indication of this in yoke force and the indicator (trim needle) was responding in a down direction.

At about 600 feet and buffet onset I pulled off power, intending as a last resort to roll to 90° before stall, get the nose over and then wings level for water impact. However, with reduced power and (by now) full nose down trim the nose hung for an instant in moderate to heavy buffeting and then fell through rapidly. With power and rudder-aileron trim the aircraft recovered under marginal control at about 100 feet.

Within the next minute as I tried to establish a climb, this cycle (mild pitch-up, roll and yaw with power off, down-trim, and buffeting flop-over on top) repeated itself about three times, but each became less severe than the previous, and more responsive to trim and power corrections.

After stabilizing power and trim with an airspeed of 170 knots, flaps down, I climbed to 10,000 feet to check flight characteristics. With squadron representatives and the CO on the radio I ran through procedures to determine the malfunctions. (The slats were obviously stuck, but the elevator discrepancy was not apparent—and all likely, correctable causes were eliminated.)

The aircraft flew normally at speeds in excess of 155 knots in the landing configuration. Decelerating below this speed would induce the pitch-up, roll and yaw motions. These went from mild to severe as the speed decreased and at about 148 knots became impossible to control with only trim and power to counteract the pitch-up.

I was diverted to NAS Sigonella, Sicily (8000-foot runway). At 3000 feet altitude with wings empty and 9000 pounds internal fuel, the flight characteristics were again checked and the aircraft was determined to be stable down to 145 knots.

I set up on a long straight-in over level terrain at 50 feet and 150 knots controlling speed and altitude with trim and power. Approaching touchdown power was eased off and exchanged for nose-up trim as the aircraft decelerated, flying parallel to the runway at 2-3 feet.

At about 140 knots the nose pitched up and the right wing dropped. The tail skag and starboard main mount touched briefly and seemed to bounce the aircraft back into aligned flight. The next touchdown, very shortly after the first, was again on the skag and starboard main, and the aircraft rotated gently onto the port main and nose gear.

The chute deployed normally and Hytrol braking was effective. The aircraft stopped well short of the runway end.

Subsequent investigation re-

ANYMOUSE

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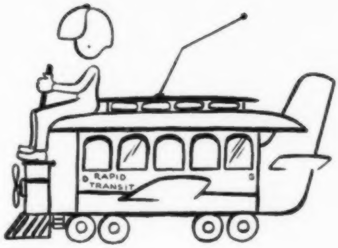
vealed that during this flight two separate malfunctions had occurred which caused his control difficulties:

1. The port outboard and inboard, and starboard center wing slats were inoperative and remained in the closed position after the catapult shot.

2. A Dzus fastened inspection plate from the DECM compartment was adrift in the cockpit and had become lodged in the elevator control counterweight. This restricted forward movement of the yoke beyond neutral (approximately 8 inches from the instrument panel) for the remainder of the flight.



No Head Work

WHILE walking down the flight line I saw an F9F pilot taxi about 1/4 of a mile to the flight line with three or four men riding on the leading edge of the wing. The pilot was from another squadron, but I was amazed at his lack of head work.

Side Boy

AFTER arrestment the A4D was directed from the gear to the centerline of the ship. The jet blast from another jet on the port cat (the blast deflector being down) and the angle which the aircraft was taxied to the relative wind tipped the A4D over on the starboard wing.

Why: The CVS we were working with had not handled jets in over a year and was unaware of the A4D crosswind characteristics.

Damage to wingtip and droptank was minor but a few more knots could have caused the aircraft to go all the way over as has happened before.

Scouting Pays Off

APPROACH to landing was made in an R7V at a Pacific airfield not equipped with control tower and with weather reporting facilities.

Cloud condition was scattered with widely scattered rain showers in the area. A light rain shower had just passed nearby the field and was located two miles from the approach end of the runway. Wind was calm over the duty runway.

Immediately prior to touchdown (A/S 120 KTS) the aircraft encountered extremely severe buffeting and turbulence and the rapid application of maximum power was required to avert an accident. The transition from apparently calm air to violent buffeting was instantaneous and not accompanied by any visual or other sensory indications.

On second approach for landing, a tornadic type phenomenon was sighted approximately 700 ft. down the runway just as the aircraft crossed the runway threshold. The disturbance was about 100 ft. wide at the visible median level of 75-100 ft. above runway elevation (103') and consisted of violent cyclonic winds carrying aloft a considerable amount of stone and coral. A maximum power wave-off was immediately initiated but the aircraft was unable to avoid encountering the disturbence a second time. Again, the turbulence can only be described as violent and near-disastrous. A third approach for landing was delayed for about 45 minutes and proved uneventful.

There are two significant aspects of the incident that are believed to be worthy of comment:

(1) This is a clear example of a situation where a high level of crew coordination, specifically, a flight engineer's instantaneous response to a call for "maximum power," spelled the difference between a successful wave-off and an aircraft accident.

(2) To preclude repetition of the type incident, this command has adopted the following as standard operating procedure: Whenever landing is to be made at an airfield with limited or non-existent tower and weather reporting facilities, it will be preceded by a low investigative pass with gear-up, partial-flap and 2400.

H. B. KENTON, CDR

HEADMOUSE

'What's in it for me?'

Dear Headmouse:

Let us face a very serious and insidious problem in naval aviation today. It is not coming; it is here now and has been for some time. There is seemingly less and less motivation to fly each year.

I feel this loss of motivation to fly is directly attributable to prevailing selection policies and action of selection boards. A cursory examination of officers passed over for promotion to the ranks of LCDR, CDR and CAPT, will reveal that aviators suffered a greater attrition in the selection board rooms than did their general service line or staff contemporaries. Our junior officers have seen the figures.

Their natural reaction is to ask themselves, "What's in it for me?" "Why should I get out there and bust my you-know-what flying when it does not mean anything?" It has long been known that experience and ability in an airplane have meant very little promotion-wise in the Navy. If it did mean anything, a large number of our enlisted aviation pilots should be admirals. Of course, being a thorough and highly competent professional pilot adds to your own self-confidence and longevity, but means little when you are forced to retire due to being passed over.

Farfetched? Not on your NATOPS manual! Last year I grimaced as I saw the only true professional naval officer and pilot in our squadron passed over for CDR. An isolated case? Not at all! Anyway, after seeing him fail to get by the BuPers selection board, a number of us junior pilot types in the squadron started thinking and then talking to each other about this problem. We all have the Why-should-I feeling. We certainly do need some motivation to fly and the best that we can think of is immediate improvement in the promotion of aviators.

As for me, I need positive reassurance, motivation, and to actually see well qualified, highly experienced, professional naval aviators promoted. No promises! Just promotions and recognition of top notch work and qualifications and experience. Do that and some spark of motivation will be rekindled.

A FORMER OPTIMIST,
NOW A REALIST

▶Headmouse passed this letter to an admiral recently returned from duty with a selection board. The gist of his remarks are as follows:

The tenor of your plea appears to be that you feel there is a need for better motivation for Naval Aviators—specifically, more motivation directed toward you as an individual. This is a very natural and universal human need and it may be answered with the question: "Who doesn't?" But more on that later.

But to get to you—you have elected voluntarily to follow the profession of a Naval Aviator. You can be assured that if you perform in a consistently outstanding manner in this profession, year in and year out, it will be impossible to convene a selection board which will do anything other than to select you for promotion, either before, or when you are due.

You appear to be convinced that some discrimination exists in the promotion of Naval Aviators. The unnamed commander you cite as an example may be all that you believe he is; however, you are viewing at the most, possibly 2 years performance by this individual which is probably not more than 1/10th of his career. The selection board must look carefully at the 1/10th you describe as well as the remaining 9/10ths, and then make a judgment concerning his overall value to the service in the next rank as compared to each of his contemporaries.

The naval aviation population of some 22,000 officers has been maintained with excesses. To select an excessive number of aviators over and above the total number of aviation billets to be filled only results in later surgical measures similar to the hump legislation and the discontinuation procedures.

The selection opportunities through the grade of commander for Naval Aviators now and in the immediate future are as follows:

Through the grade of LCDR— 90 to 95%

Through the grade of CDR— 70 to 75%

One basic fact that you are overlooking is this—we are first of all naval officers. A Naval Aviator is a Naval Officer with a specialty—a specialty in naval aviation. Granted, aviation is a tremendous field in itself, but let's face it, it is only one facet of your naval career. Being a top-notch pilot of combat aircraft is not enough—an individual must have more than this to offer, otherwise his usefulness to the Navy and his country will expire somewhere during his middle years, or earlier if the resources of his physical plant should start to fail.

There is one bright ray of hope in this for you and other tigers of your kind. It has been observed that the top-notch Naval Aviator is also a very competent gent in other endeavors as well. In other

words, he has the ability and is likely to perform well across-the-board. Any top-notch performer who does his very best in every assignment will not have need to seek responsibility and promotion —it will seek him.

Very resp'y,

Headmouse

Showmanship?

Dear Headmouse:

Recently aboard a CVA, an airshow was being held for a group of visiting SecNav guests. There were a large number of people on the flight deck, particularly on the port side, as the ordnance was being expended on the port beam. Just as two A4Ds completed a strafing run down the port side, from astern forward, a loud, sharp crack was heard by the people forward and a few people noticed an object skidding down the deck.

That object was a 20mm projectile and the loud noise was the result of this projectile passing through a rotor blade of the HUP, spotted on the port bow, under which many people were standing.

The members of this ship's air group attributed the incident to a projectile ricocheting off the water and no doubt they will insure that future runs are made angling away from the ship and further out. Airshows are certainly an impressive sight, but this came very close to being a tragedy. Perhaps other airgroups should review their airshow procedures.

ANGELMOUSE

▶ That "the show must go on" is a fine tradition for the stage. It's a tradition with us, too—but the price we pay dictates greater care.

Very resp'y,

Headmouse

Dear Headmouse:

You won't believe this—I could hardly believe it myself. When I was in a RAG squadron we were carqualling on the USS ————————. The first day was a dependents cruise. The dependents lined up on THE FOUL LINE on the flight deck to watch some touch-and-go's by several types and a final trap by each. As if that isn't bad enough, the aircraft were manned by RAG students who were still qualling.

These are the facts—you check'em.

ANYMOUSE

▶ I'm like you—I can hardly believe it. It does remind us all, however, that keeping all unnecessary personnel off the flight deck during flight operations is a continuing problem and deserves the close attention of all concerned. Upon examing a recent photo of an aircraft being catapulted, *thirty* personnel were counted around the catapult officer. The acres of flight deck are hazardous ones especially for the untrained and unaware.

Very resp'y,

Headmouse

Prospects of Underwater Escape

Dear Headmouse,

I am sending an article from the Martin-Baker Review (No. 8) which I think describes an excellent underwater escape system for ejection seat equipped aircraft. What is the status of development, if any, of such a system for our aircraft?

"On 27th June 1962 the Martin-Baker Aircraft Company, in conjunction with the Royal Navy, carried out a live demonstration of their new underwater escape system at HMS Vernon, Portsmouth. Following a series of dummy tests, Surgeon Lieutenant Commander A. Davidson of the Institute of Aviation Medicine was ejected from a submerged aircraft cockpit at a depth of approximately 10 feet and brought safely to the surface without any action on his part.

"This new scheme, designed to provide escape facilities for pilots who may be injured or rendered unconscious by their aircraft striking the water and who are therefore unable to abandon the aircraft in a normal manner, employs compressed air as motive power, as underwater firing of the cartridge operated ejection gun could possibly injure the pilot.

"The compressed air bottle is operated by a specially designed and patented hydrostatic valve actuated by water pressure as the aircraft sinks. Upon ejection two bladders, one behind and one underneath the pilot, are inflated to ensure clean separation, the guillotine severs the parachute lifting lines and the life jacket is automatically inflated. In this manner the pilot is not encumbered with an open parachute and can be kept afloat until a rescue is effected.

"This was the first demonstration of an underwater escape scheme capable of bringing about successful ejection through a closed canopy."

ANYMOUSE

▶ The Air Crew Equipment Laboratory of Philadelphia is continuing research on the problems of underwater escape. (See "Escape from Sinking Aircraft," May 1962 APPROACH.) The results of this research are not known at this time; however, it is known that compressed air charge as a means of propulsion was being considered as one of the methods to reduce water impact forces on the pilot.

In February, 1962, NASC was advised by BuWeps that development of automatic parachute release, automatic life vest inflation, and automatic self-inflating, self-righting life raft would be given high priority in the Research and Development program.

Very resp'y

Headmouse

Have you a question? Send it to Headmouse, U.S. Naval Aviation Safety Center, Norfolk 11, Virginia. He'll do his best to help.

LANCE STERLING

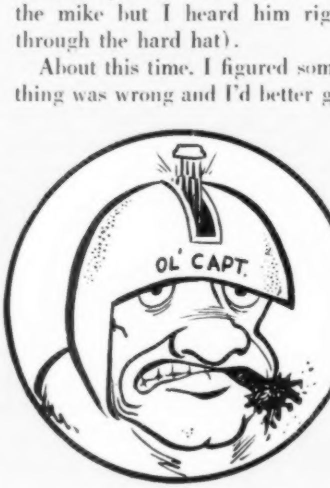
HELP

WE were 150 miles southeast of NAS, New York, at the mid point of our surveillance hop. I had the S2F on autopilot and was telling Lance, my copilot, how to outside-loop an N2S when 'radar' called to tell me for the third time he still had no luck with the gear. Well, to tell the truth, I don't know much about how to operate an APS-38 but once in a while I get lucky turning the different switches back and forth, and banging my fist on the side of the console. So I told 'radar' I'd be right back to help him out (besides Lance didn't even know what an N2S was, and I don't think he would ever try an outside loop anyway).

It wasn't easy getting out of the left seat with the poopy suit on, especially for a man of my proportions, but I managed it, after telling Lance "the autopilot is on —you have it, I'm going to straighten things out in the back room." Tapping my hardhat and pointing to Lance (a carry-over from the good old fighter days) I slowly squirmed thru the tunnel and sat down on the deck between the two rear seats.

I decided to rest a bit after the exertion, drew out a Bering Panatella and lit up. The ash was just about flickable when I noticed the plane was turning to port and starting down hill in a 20-degree dive. Well, I figured Lance was starting down to buzz a merchant or a sailboat. Whenever I leave him alone up front, he likes to show initiative. I wasn't plugged in so I couldn't ask him, but I got up on one knee to take a look over the nose. 'NO SHIP.' We had been at 800 feet, upon hitting 200 feet the worms broke the bag. The nose pitched up sharply, the crewmen grabbed the sides of their seats. I was thrown face down in the aisle with the Bering butt clenched in my teeth. Lance was screaming "run away trim." (he was not on the mike but I heard him right through the hard hat).

About this time, I figured something was wrong and I'd better get up front fast. To my dismay, the *Stoof* was climbing *straight* up, so to get to the cockpit I had to inch my way up on my belly. Each time I paused, thinking I'd never make it, Lance would let go another loud one and I'd find new strength.



Well, when the old captain (he always calls me captain) got his head to the rear of the pedestal, the sight was enough to unnerve a lesser man. I spotted the red panic button and gave that a shove. Lance was still hollering and pushing with his hands and knees against the yoke. I noticed the airspeed indicator passing through 80 knots, so I grabbed the pedestal

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by LCDR J. J. Schneider
NAS, N. Y.

with my right hand and the yoke in my left and gave a mighty heave—the nose fell through immediately and we headed straight down towards the water. Back I pulled and up came the nose. The 'old master' was in the saddle again and still on my belly, but using the *gyro horizon* I leveled her off, and slowly climbed into my seat.

Lance has a habit of going quiet after I've pulled us out of a close one but it didn't take long to figure out what had happened. Lance had started a turn using the autopilot and when the turn was a little erratic he knocked off the autopilot. The nose dropped and Lance eased back on the yoke—no response. Lance, even after flying with me many months, made the wrong move. He decided the trim was running away and hit the emergency trim stop. Then he was in trouble, no control at all. 'cause he was too busy wrestling with the yoke to try the emergency trim control. About this time, he began hollering for old dad, which was the smartest thing he did all day.

Well sir! By now you probably guessed it. Lance Boy *had his yoke disengaged* all the while. He has a habit of doing that when he's working on that big plotting board of his. And I told him many times to leave that thing in the readyroom cause I knew it would get us in trouble someday.

Our CO (who happens to be a little on the stuffy side) didn't agree that the plotting board was the culprit. In fact, if I weren't the hottest pilot in the squadron I would have imagined he was pointing the finger at me when he hammered away at some regulation he dug up that says *you shouldn't leave the left seat unattended.*

To tell you the truth it bothered me a little and I'm the first to admit it when I make a mistake. So just to reassure myself I bought a couple of rounds at the club for some of the old World War II fighter types and put it to them. Some felt Lance Sterling responsible, some the plotting board—but to a man they held me blameless. Even so, I've been spreading the word ever since, that if you're flying with Lance Sterling or some other navigator type you better stay glued to that left seat. ●

does it again!

By Lester Carlyle

Human Factors Engineer, Douglas Aircraft Company Co., Inc. Bio-Mechanical Design Section

HIGH ALTITUDE BREATHING

The problems of breathing during exposure to high altitude have existed since aircraft were developed to fly above 10,000 feet. Although years of research on these problems have produced mountains of information, the acquisition and interpretation of this information is difficult for flight personnel.

For example, the physiological effect of reduced ambient pressure is usually stated in such terms as "oxyhemoglobin saturation," "partial pressure of alveolar oxygen," or "alveolar carbon dioxide." Times of useful consciousness have been determined while breathing ambient air or 100 per cent oxygen, at reduced pressures, but not as a function of pressure breathing, which is of vital importance in high altitude flight. Times of descent for free fall or with an open parachute are usually shown to sea level, but times of descent to the maximum altitude at which consciousness will be retained without emergency breathing equipment are of more immediate concern to the flyer who must leave an aircraft without an automatic parachute opener.

In addition, general discussions reveal that even though experienced flight personnel know the operation of their oxygen and survival systems, the criteria upon which this equipment has been designed are only vaguely appreciated. Limitations of man and equipment are often distorted by rumor and secondhand tales of superior or inferior performance.

The need for clarification and simplification of this situation is obvious.

Physiologically Equivalent Altitudes

The physiological effects of breathing in various environments are generally described in terms of partial pressures of gases in the lungs and oxygen saturation of arterial blood. The environments most often studied in aviation medicine are ambient air and 100 per cent oxygen, at both normal and reduced pressures. The outward manifestations of the adverse physiological effects are often described in such terms as "Appreciable Handicap," "Serious Handicap," and "Imminent Collapse." These terms are too vague to be useful.

A better comparison of the effects of breathing ambient air or 100 per cent oxygen at high altitudes can be made on the basis of the partial pressure of oxygen in the lungs. Altitudes at which identical physical effects occur are known as Physiologically Equivalent Altitudes.

The total gaseous pressure in the lungs equals the sum of the partial pressures of the component gases. For ambient air breathing, this relationship can be expressed as follows:

$$P_T = pO_2 + pCO_2 + pH_2O + pN_2$$

The partial pressure of water vapor in the lungs is relatively constant at 47 mm of mercury. When only 100 per cent oxygen is breathed, the nitrogen factor is eliminated. This leaves oxygen and carbon dioxide as the two significant variable components of respiratory gas during assisted breathing.

The variation of oxygen and carbon dioxide par-

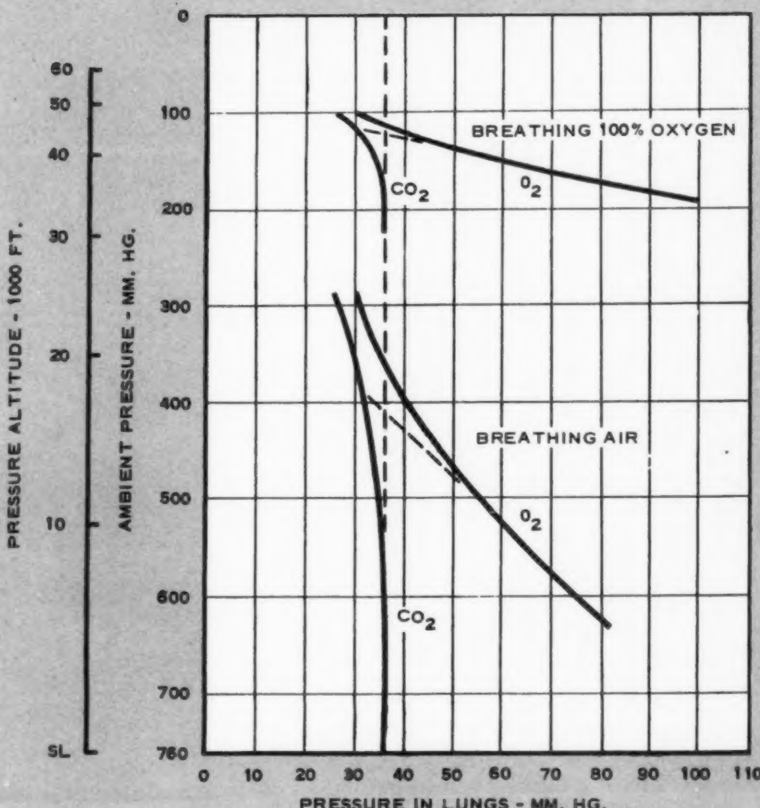


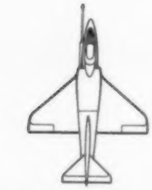
FIGURE 1. PARTIAL PRESSURES OF RESPIRATORY GASES

tial pressures in the lungs as a function of altitude is shown in Figure 1 (Ref. 1). Notice the marked change in slope of the curves for air breathing when the ambient pressure drops below 550 mm Hg (8700 feet). The carbon dioxide partial pressure drops markedly below the normal control level, 36 mm Hg, while the oxygen partial pressure also drops, but at a much slower rate. This deviation is due to an automatic physiological adjustment starting at this ambient pressure, which first increases the depth, then the rate of breathing. To illustrate, most persons will lose consciousness when the partial pressure of oxygen in the lungs drops to 30 mm Hg for 2 to 3 minutes. Theoretically, this would be expected to occur at a pressure altitude slightly above 17,000 feet. However, due to respiratory adjustment, this condition is not reached until a pressure altitude of about 25,000 feet is reached, a gain of about 8,000 feet, (Figure 1).

A similar deviation occurs when 100 per cent oxygen is breathed at higher altitudes, although the additional altitude gained through the respiratory adjustment is less than for the air breathing case. For example, when breathing 100 per cent oxygen, the critial oxygen pressure of 30 mm Hg would be expected to obtain at 44,000 feet. Actually, with respiratory adjustment, this reduced pressure level is not reached until the pressure altitude equals 47,000 feet, a gain of only 3,000 feet, (Figure 1).

The pressure regulator schedule, (Ref. 2), can be added to the oxygen pressures in the throat for various altitudes and the physiologically equivalent altitudes for pressure breathing thus determined, (Figure 2).

Text continued on page 34



HIGH ALTITUDE BREATHING CHART

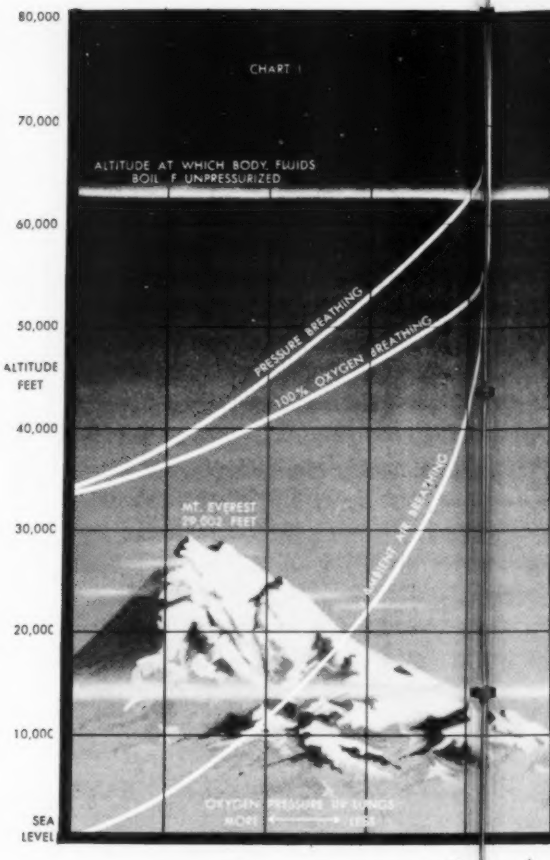


CHART I

PHYSIOLOGICALLY EQUIVALENT ALTITUDE

This chart explains, in nontechnical language, some physiological aspects of breathing at high altitude without a pressure suit. It is intended to supplement the more detailed physiological programs conducted by military and commercial flight organizations. The flight surgeon, physiological officer, or medical director is the primary source of information on all aspects of high altitude breathing and should be consulted regarding specific situations.

Even though most flight personnel know how their oxygen and survival systems operate, the criteria upon which this equipment is designed are only vaguely understood. Such information is available in the technical literature of aviation medicine, but its acquisition and interpretation is often difficult for the airman.

For example, the physiological effect of reduced atmospheric pressure is usually described in terms such as "oxyhemoglobin saturation" or "partial pressure of alveolar oxygen." Time of useful consciousness has been reported for breathing plain air or pure oxygen at various altitudes, but not for breathing oxygen under positive pressure. Times of descent for free-fall or with an open parachute are usually shown to sea level. However, if the flyer must leave the aircraft with no emergency breathing equipment and no automatic parachute opener, his concern is to retain consciousness until he drops to an altitude where he may open his parachute safely. With an automatic opener the parachute will open even if the flyer loses consciousness.

Further complicating the aviator's understanding of the situation are rumors and unfounded reports of superior or inferior performances which distort the true capabilities of man and equipment.

The consequences of bailout or ejection at high altitude depend on the type of survival gear worn and its retention or loss during descent. A bailout oxygen supply will prevent serious hypoxia during free-fall from as high as 50,000 feet, although tumbling may cause disorientation or unconsciousness. Above 50,000 feet, hypoxic effects increase rapidly to serious proportions.

Some emergency oxygen systems are always open to ambient dilution during descent, thereby decreasing time of consciousness at high altitude, but also reducing probability of suffocation upon depletion of oxygen. Closed oxygen systems, while increasing conscious time at altitude, require removal of the mask following oxygen depletion to avoid suffocation.

As altitude increases, the partial pressure of oxygen in th[e atmos]phere decreases and supplemental breathing aids are [...] to maintain ample oxygen in the lungs. Thus breathing [...] air at some specified altitude has the same effect on th[e] body as breathing unpressurized 100% oxygen at a hi[gher al]titude or pressurized 100% oxygen at a still higher alt[itude.]

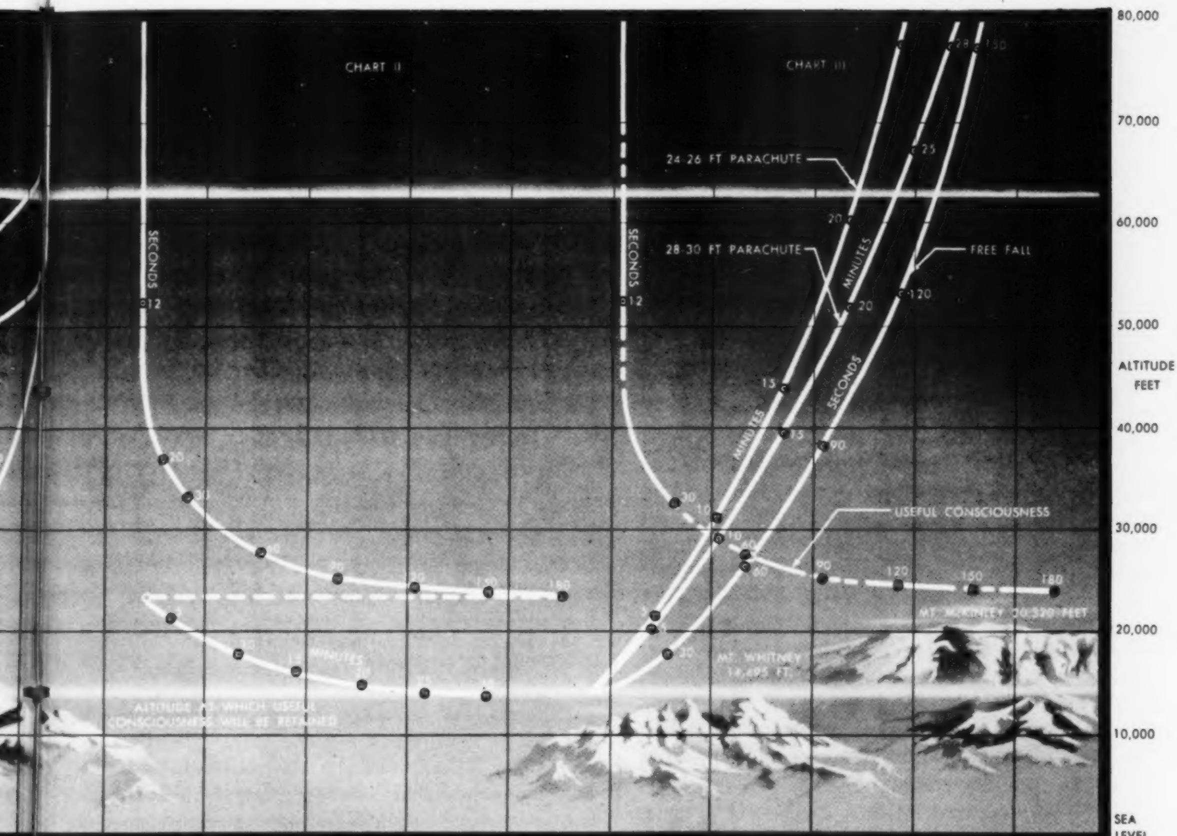
Altitudes at which identical physiological effects occur ar[e known] as PHYSIOLOGICAL EQUIVALENT ALTITUDES. The curve[s] above enable the flyer to relate supplemental breathing [...] to the more common experience of ambient air breathin[g] to moderate altitudes.

The curve labeled *pressure breathing* is representative [of] currently used pressure regulators and is based on a [...] range of 2 to 18 inches of water (0.07 to 0.65 psi).

EXAMPLES:

Ambient Air	100% Oxygen	P
Sea Level	33,000	
10,000	40,000	
23,500	47,000	

FIGURE 2.



...LENT ALTITUDES

...re of oxygen in the atmos-
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	Pressure
	34,000
	44,000
	54,000

CHART II

TIME OF USEFUL CONSCIOUSNESS

Useful consciousness, although hard to define, can be considered generally as the physiological condition of experienced airmen in which they can maintain awareness of their environment and proper control of their aircraft. The airmen under discussion are considered to be adapted physiologically to sea level conditions and are not to be confused with persons acclimated to high altitude living.

Conscious time will vary over a wide range depending on factors such as individual tolerance and breathing rate, rate of dilution by ambient air, rate of exposure to ambient air (accidental oxygen disconnect vs rapid decompression) and physical activity. The curves shown above are based on a moderate level of activity following oxygen disconnect or depletion.

To determine TIME OF USEFUL CONSCIOUSNESS:

1. Enter Chart I at flight altitude and cross horizontally to appropriate breathing curve; 2. Drop vertically to curve labeled *ambient air breathing;* 3. Cross horizontally to Chart II; note difference in time scales.

EXAMPLES:

Condition	Ambient Equivalent	Time
100% O_2, 39,500 ft.	10,000 ft	Infinite
100% O_2, 52,000	38,000 ft	20 Sec.
Max Press. 54,000	23,500 ft	4 Min.

CHART III

DESCENT TO SAFE BREATHING ALTITUDE

At 28,500 feet, time of useful consciousness while breathing ambient air is the same as time to free fall to 14,000 feet where consciousness will be retained indefinitely. In this case, consciousness would be retained. Descents from greater altitudes without bailout oxygen may result in unconsciousness from hypoxia. Should a bailout or ejection be necessary above 28,500 feet with neither bailout oxygen nor automatic parachute opener, any one of three breathing techniques should enable the flyer to retain consciousness while dropping to low enough altitude and velocity for safe, manual opening of the parachute:

1. Hyperventilation, or overbreathing, with inhalation effort.
2. "Grunt-breathing," where a deep breath is taken, the throat is closed, a hard grunt is made, then the breath is released; the entire process is repeated as often as necessary.
3. "Peak-breathing," where a deep breath is taken and released while shouting the word "Peak" with a short, rapid exhalation effort; the entire process is repeated as often as necessary.

APPROACH POST-IT NO. 4

Time of Useful Consciousness

Possibly the most meaningful measurement of the effects of reduced oxygen pressures, as far as flight personnel are concerned, is the Time of Useful Consciousness. This factor is hard to define due to sizeable tolerance differences between individuals, varying degrees of oxygen dilution and physical activity, etc. For all practical purposes, useful consciousness can be considered generally as the physiological condition of experienced airmen in which they can maintain awareness of their environment and proper control of their aircraft. The airmen under discussion are considered to be adapted physiologically to sea level conditions and are not to be confused with persons acclimated to high altitude living.

Time of Useful Consciousness has been studied and reported for various conditions of altitude and auxiliary breathing equipment. These include breathing ambient air after deliberate mask removal at altitude, breathing ambient air after rapid decompression, and breathing 100 per cent oxygen after rapid decompression. One important condition for which the Time of Useful Consciousness is often inadequately defined, is pressure breathing at extremely high altitudes. Most pressure breathing systems start operating at 35,000 feet, thereby maintaining, at that altitude, an atmosphere physiologically equivalent to sea level in the crewman's lungs. Up to 35,000 feet, 100 per cent oxygen alone is sufficient to maintain this sea level equivalent. However, serious hypoxia may be encountered starting at 40,000 feet while breathing 100 per cent oxygen. This is physiologically equivalent to breathing ambient air at 10,000 feet.

On the basis of Physiologically Equivalent Altitudes, the Time of Useful Consciousness can be determined for all altitudes and breathing conditions by relating them to ambient air breathing for which tolerance times are well established.

The curves shown in the center portion of Figure 2 have been modified from those reported in the quoted works of Luft, (Ref. 3). In these studies a sedentary level of activity existed following exposure to reduced oxygen pressures. In actual aircraft operation, a somewhat higher level of activity is to be expected; and, consequently, the time tolerance curves have been adjusted downward as shown in Table 1, (Ref. 4). Smoking, drinking and hypertension further decrease the time of useful consciousness.

Table 1
Time of Useful Consciousness

Altitude (1000 Ft)	Rapid Disconnect (moderate activity)	Rapid Disconnect (sitting quietly)
22	5 Min	10 Min
25	2 Min	3 Min
28	1 Min	1 Min 30 Sec
30	45 Sec	1 Min 15 Sec
35	30 Sec	45 Sec
40	18 Sec	30 Sec
65	12 Sec	12 Sec

Survival Factors in High Altitude Escape

Several additional factors must be considered when discussing survival following bailout or ejection at high altitudes:

1) Type of emergency equipment, excluding pressure suit
2) Retention or loss of emergency equipment
3) Emergency breathing technique
4) Time of descent to safe breathing altitude

Type of Emergency Equipment

During most ejection sequences, the pilot's oxygen equipment is automatically disconnected from the ship's supply and his emergency supply is automatically actuated. Certain other systems require manual accomplishment of these items.

Following disconnect from ship's oxygen supply, some systems are open to dilution by ambient air, while other systems are completely closed. While the time of useful consciousness with an open system is reduced by ambient dilution, the flyer always has air to breathe even if his emergency supply becomes depleted. Closed systems provide only pure oxygen but, upon depletion of the emergency supply, some vent automatically to ambient, while in others the mask must be removed or an anti-suffocation device actuated to prevent suffocation. *(Although the Navy is working on an anti-suffocation valve it has not as yet been achieved.—Ed.)*

It is obvious that the flyer must thoroughly understand the functioning of his particular oxygen system if he is to survive a high altitude emergency.

Retention or Loss of Emergency Equipment

If emergency oxygen equipment is retained by

the flyer following escape from the aircraft, he will encounter little or no breathing difficulties. Existing emergency oxygen systems will prevent serious hypoxia following escape from as high as 50,000 feet, although disorientation or unconsciousness may result from tumbling. *(If an anti-tumbling stabilization device is not installed.—Ed.)* Above 50,000 feet, however, hypoxic effects increase rapidly to serious proportions. On the other hand, if part of the emergency oxygen equipment is lost during a high altitude escape, unconsciousness may occur due to hypoxia during descent. A means to avoid this by a special breathing procedure is explained later.

Even if unconsciousness occurs, automatic parachute openers will open parachutes at the proper altitude for survival. In ejection systems, the automatic opener is usually armed during separation from the seat. In some bailout systems, however, the automatic opener must be armed manually following separation from the aircraft. Again, the importance of the flyer understanding his equipment cannot be overstressed.

Emergency Breathing Techniques

As stated previously, if part of the emergency oxygen system is lost during a very high-altitude escape, the flyer may be expected to lose consciousness after a short time if he breathes ambient air at a normal rate during free fall. However, there are breathing techniques by which he can retain consciousness during free fall from high altitudes to 14,000 feet where consciousness may be retained indefinitely without supplemental oxygen:

1) Hyperventilation, or overbreathing, with inhalation effort
2) "Grunt-breathing," where a deep breath is taken, the throat is closed, a hard grunt is made, then the breath is released; the entire process is repeated as often as necessary
3) "Peak-breathing," where a deep breath is taken and released while repeatedly shouting the word "PEAK" with short, rapid exhalation effort; the entire process is repeated as often as necessary.

Time of Descent to Safe Breathing Altitude

Definition of an exact maximum altitude at which consciousness will be retained indefinitely with moderate activity is impossible due to individual tolerance differences and varying activity levels. For the purpose of this report, however, an altitude of 14,000 feet will be considered to be the maximum for retention of consciousness.

Thus, if a flyer escaping from an aircraft at a high altitude can retain consciousness until he reaches 14,000 feet, he will probably not lose consciousness at all. As stated previously, the flyer with operable emergency oxygen equipment and the flyer practicing special breathing techniques can reach this altitude in good shape, as far as hypoxia is concerned. It is the flyer breathing ambient air during his descent who may pass out. If his parachute automatic opener has not been armed, or if he has none, his chances of survival depend on his regaining consciousness in the last few thousand feet of free fall. At best this is an undesirable risk.

The right portion of Figure 2 shows times of descent to 14,000 feet for free fall, with a 24 or 26 foot diameter parachute, and with a 28 or 30 foot diameter parachute, (Ref. 5). The Seconds of Useful Consciousness curve has been repeated to allow comparison with descent times. Note that the time to free fall from 28,000 feet to 14,000 feet is the same as the useful consciousness time at 28,000 feet. This indicates that 28,000 feet is the highest altitude from which a flyer can free fall while breathing ambient air and retain consciousness. Actually, as the flyer falls into increasingly denser air, his tolerance increases, but this advantage may be considered a safety factor which compensates for other previously described variables, such as hypertension or alcohol in the blood.

Enlargements of Chart

For a 16 x 20 inch color reproduction of the chart shown in Figure 2, write for "High Altitude Breathing Chart" to Douglas Aircraft Company, Inc., Aircraft Division, Department C2-250, Long Beach, California.

References

1. Boothby, W. M. Lovelace, W. R.; et al "Handbook of Respiratory Physiology," Ch. 4, USAF School of Aviation Medicine, September, 1954
2. Military Specification, Regulator, Aviator's Miniature Oxygen Breathing, 100% Demand Type, with Automatic Safety Pressure and Automatic Pressure Breathing MIL-R-19121A (Aer), 13 September 1956
3. Luft, U., Handbook of Respiratory Physiology, Ch. 8, USAF School of Aviation Medicine, September, 1954
4. Instructors Manual for Physiological Training, USAF Manual 52-13
5. Webster, A. P., "Free Falls and Parachute Descents in the Standard Atmosphere," NACA Technical Note No. 1315

NO TROUBLE

AFTER signaling his position in the water with a flashlight, tracers and a night flare, a pilot who had ejected from an F3H was picked up by plane guard destroyer. When the ship made an approach putting him about 20′ off the starboard quarter the crew threw a line over to him. He swam to it, grabbed hold and was pulled back to a cargo net hanging over the side. A diver jumped into the water to help him release his seat pack and enter a sling. He was pulled up in the sling—hanging on to the cargo net as he went.

"Smooth and coordinated" were the pilot's words for the destroyer's efforts. "I had no trouble getting aboard."

An endorser on the report of this same accident commented on the joint destroyer-squadron training program.

"Through the group and squadron's safety officers we have instituted and carried out an aggressive indoctrination program with our accompanying destroyers," he stated. "The enthusiasm and interest displayed by our plane guard destroyers in learning the details of pilot equipment and how to assist us once in the water has been most commendable. Detailed knowledge of equipment and continued refresher training in its proper use has paid off. Lives have been saved and confidence in equipment and procedures has been achieved."

notes from your flight surgeon

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.38 Cal. Pistol

LTJG .... stated that after emptying his pistol he experienced difficulty in extracting the empty shell cases from the magazine. This explains why he reloaded and fired one tracer at a time after entering the water. Due to a lack of recent experience in firing the pistol, he forgot about the shell extractor feature of the .38 cal. revolver. This forgotten item was not of serious consequence in this accident but all pilots should be fully qualified in the operation of this important piece of survival equipment.

The LTJG also stated that he did not have a lanyard attached to his pistol. It would be very easy to drop and lose the pistol in this situation.—*From an AAR*

Didn't Use Life Vest

THE PILOT of a ditched P2V-4 escaped through the port escape hatch. Once in the water, undertow on the port wing began to suck him under. When he called for help, one of the passengers pulled him onto the wing prior to boarding the life rafts. *At no time did the pilot inflate his life vest.*

Dye Marker

DYE marker accidentally spilled from its container on the air crewman's life vest. Rescuers on the destroyer stated that, although it was night and visibility was poor, when they shined their lights on the water the first thing they saw was the dye marker which guided them to the survivor.

—*From an MOR*

(*A floating aluminum particle type dye marker that is manufactured specifically for night reflection is now under evaluation.* —*Ed.*)

Fatigue

ON a busy flight deck fatigue is ever-present yet often not recognized by many, including the individuals involved. This is attested to by casual observation of the numbers of sleeping bodies found on the flight deck, hangar deck, and within the island structure almost any hour of flight operations and particularly after 8 to 10 hours of operations. It is further attested to by a popular belief that most aircraft handling crunches occur at times when fatigue is most present, particularly during the final respot after flight operations.

Training of most flight deck personnel does *not* include the subject of fatigue or night vision. There is a general lack of the close formal surveillance such as annual physical examinations, training and proficiency qualification of flight deck personnel.

—*Flight Surgeon in MOR*

Signal Flares

ON A pitch black night a pilot who ejected after a midair collision parachuted into a river. He inflated his life raft and climbed aboard. Seeing a boat and helicopters searching for him up river, he tried to get flares from his seat pack but could not locate them by sight or feel. He gave up and began to sing and yell. Some civilians on shore heard him and put out in a small boat for the rescue.

The pilot completely forgot that there were signal flares in his Mk3C life vest. He admits that his familiarity with his survival gear was not what it should be.

Results of this situation had the pilot parachuted into open ocean are best left to the imagination.

Missing Survival Equipment

NUMEROUS cases have been reported recently of missing first aid kits and battle lanterns. These important pieces of survival gear have been placed aboard the aircraft for your protection. It does not require much logic to realize that if these are missing when the need arises, someone is going to *die*. If you are ever tempted to misappropriate one of these items, just remember; you might be the next one to need a first aid kit or battle lantern.—*NAS Seattle.*

Hospital Forwarding Address

AFTER an EC-121K (WV-2) returned from a deployment, all hands turned to cleaning the aircraft. All hatches were open, including a 2′ x 2′ hatch amidships in the center of the passageway leading aft. Someone on the ground handed a crewman in the engineer's hatch a long-awaited letter from his girlfriend in the States. As he walked aft reading the letter, he stepped through the open hatch in the passageway. He hit the edge of the hatch with his left hip; his left foot and leg "stayed out" while his right side dropped in all the way to the waist. He fell forward on his face and sustained severe hip injury.

Screwdriver

A SCREWDRIVER in the lower pocket of the anti-G suit inflicted a small penetrating wound on an F8U pilot's leg during ejection.

Flight Surgeon's Recommendation: That pilots be frequently warned of the hazards of carrying pointed items such as screwdrivers loose in their flight clothing.

A place for everything . . .

In order to provide maximum dissemination of ideas for placement of the survival knife as already developed at the user level, APPROACH *readers were asked in July 1962 to send in their ideas, photos and sketches . . . Finalized ideas for carrying the sheath knife should be forwarded for inclusion in the NATOPS Manual for the particular aircraft.*

APPROACH's invitation to individuals and units to submit suggestions for the location of the survival knife brought a good response. Our thanks to all who wrote. We regret that space does not permit publication of all the material received to date.

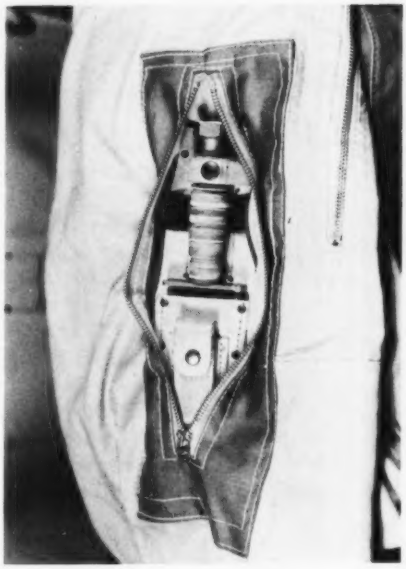
The consensus of opinion from the recommendations received seems to be to locate the survival knife on the thigh of the flight suit in a sewn-on zippered canvas pocket. This was suggested by pilots and crewmen wearing the standard flight suit and/or the anti-G suit, *not utilizing the integrated type torso harness,* and also by VP's, VS's, HS, VU's and VA (props). Installation can be on the right or left leg according to individual preference. The general means of fabricating the canvas pocket is shown in the sketch submitted by VP-30.

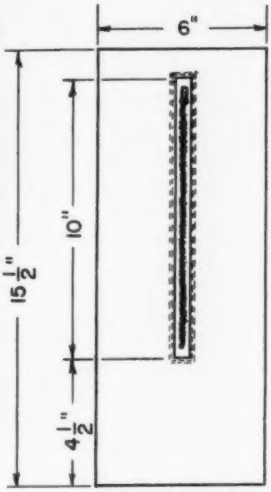
Placing the knife in a zippered pocket instead of leaving it exposed prevents the knife or its sheath from catching on the many wires, lines, cables or equipment in and around the cockpit. This also is in conformance with the various NATOPS Manuals for these model aircraft.

The consensus of recommendations for the torso harness garment is to locate the knife vertically, threaded through the cross chest strap of the torso harness and secured at the bottom as indicated in the MARTD Alameda photos. The Grumman Aircraft Engineering Corp. photos show an installation adaptable to the MA2P integrated harness which would be compatible with pressure suits.

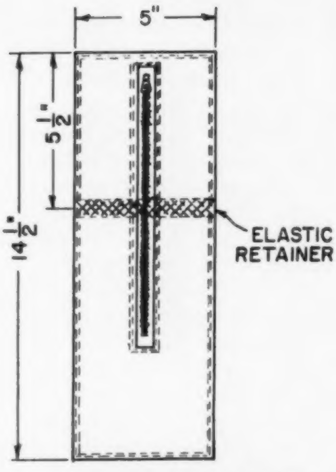
MARTD Alameda submitted installation on the torso harness located on the vertical of the torso harness strap. That command submitted a modified torso harness to the Naval Parachute Facility at El Centro, Calif., for jump testing. Both dummy and live test jumps were performed. Five live jumps were made by a NavParaFac test jumper wearing the MARTD torso harness. Test results indicated satisfactory knife retention with no hazard to the wearer during bailout, parachute opening or descent and landing. An additional advantage of locating the knife on the vertical of the torso harness strap is the relative ease in reaching the knife after the Mk-3C life vest is inflated as compared to reaching around the vest and down the legs.

The Naval Aviation Safety Center suggests that when the knife is enclosed within a zippered pocket, the sheath snap loop be removed to facilitate a more rapid removal. It is suggested that the zipper pull tab should have a leather or nylon thong attached to permit easier location and opening, also that all knives have some sort of attachment to the wearer (such as a length of line) to prevent loss while being used.





DIMENSIONS OF
CLOTH-ZIPPER INSTALLED.

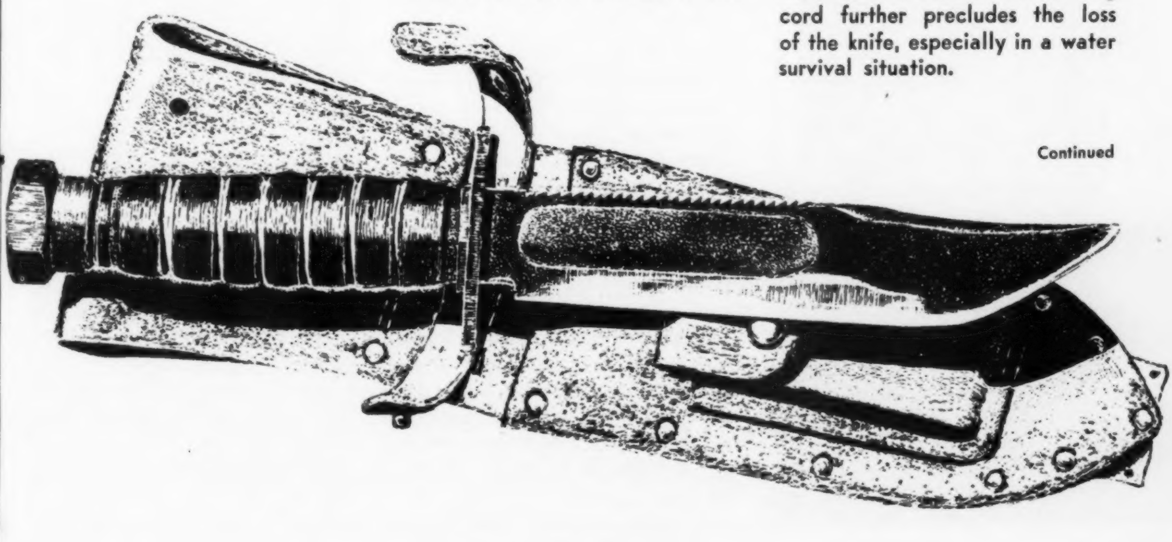


DIMENSIONS OF INSTALLED
POCKET W/ ELASTIC RETAINER.

CO, VP-30: P2V-P5M: The VP-30 "Professionals" prefer to carry the survival knife in a special zippered pocket on the thigh of the flight suit in conformance with the NATOPS Manual for P2V and P5M aircraft. Placing the knife in a zippered pocket instead of leaving it exposed prevents the possibility of the knife or its sheath catching on the many wires, lines, cables and equipment in and around the cockpit, flight deck and afterstation of the P2V and P5M. Locating the pocket on the thigh allows greater accessibility if hanging from parachute shroudlines in a tree. The knife is also easier to reach when sitting or lying down on land or in the water.

The elastic retainer shown under the knife handle in the photo is the innovation of D. G. Baker, PRI. It is installed to prevent the knife and sheath from falling out of the open pocket. Tying the knife to the sheath with a long cord further precludes the loss of the knife, especially in a water survival situation.

Continued



CO, ATAKRON 42. A1A (AD-6): The exact location of the knife as worn by VA-42 pilots will vary due to individual differences in height. The recommended placement is along the flight suit seam with the top of the sheath holder ¾ incn above the thigh pocket. The knife must be high enough not to interfere with bending the knee and be accessible when the Z-3 cutaway anti-G suit is worn. However, if the knife is too high it will interfere with the parachute leg straps and be uncomfortable when the wearer is seated in the cockpit.

CO, MARTD Alameda (endorsed by CO MART): This method of carrying the knife on the cross chest harness strap of the modified torso harness was tested by dummy and live test jumps by the Naval Parachute Facility, El Centro. The tests indicated that knife retention was satisfactory and no hazard to the jumper was noted. This method of knife retention for pilots who wear the integrated torso harness is highly recommended for the following reasons:

- *Convenience:* The knife can be reached without difficulty with either hand.
- *Comfort:* Pilots have reported no discomfort whatever with this system.
- *Retention:* Since the knife is attached at both ends of the sheath, it is extremely unlikely that it could inadvertently come loose.
- *Simplicity:* The system requires very little material and time on the part of paraloft personnel.
- *Economy:* Since the knife is mounted on the torso harness rather than on the flight suit, it is unnecessary to require paraloft personnel to constantly change knife pockets, etc., as flight suits are exchanged.

The coil of nylon is mounted on the back of the knife sheath with break-away thread. One end of the line is attached to the holes in the knife guard and the other to the sheath. The reason for the line is to prevent inadvertent loss of the knife while in the water or if hung up in a tree.

CDR JAMES L. HOLLBROOK, Naval War College: I have recently acquired the USAF switchblade knife with high visibility handle, shroud cutter, and 3" blade. Is this item to be procured for Navy use? Best feature is that this knife is smaller, lighter and safer in my opinion. It can be attached easily in many locations.

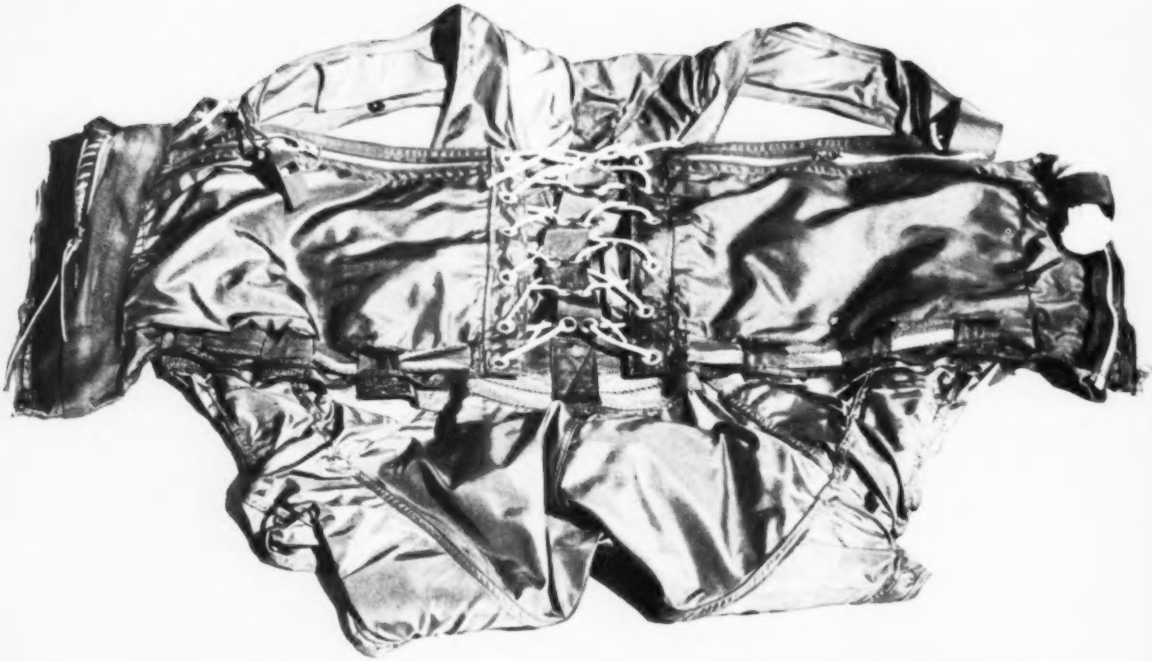
(Ed.'s Note: See Letters for how one A3D squadron utilizes this knife—The survival knife referred to (FSN 9G 7340-526-8740) is acceptable flight operational equipment and may be procured in accordance with the NavWeps 00-35QH-2 (change 1) Allowance List dated January 1962.)

Ed Campbell, Flight Safety Engineering, Grumman Aircraft Engineering Corp.: (A2F): The one knife carrying method showing the location on the leg garter is proposed for use on the Martin Baker seat equipped aircraft. The knife can be located in any position convenient to the wearer. It is possible that under certain conditions the knife will be inaccessible due to a broken arms, etc. The other location as shown on the MA2P integrated torso harness is considered an ideal location. The knife is readily accessible with either hand, and it does not restrict the pilot in any way in actual flight conditions.

CO, FAW 2: SP-2E (P2V-5FS): The best place for the pilot's/crewman's survival knife for PATRON crews wearing the QFAC with Standard Harness, summer flight suit, is a zippered pocket on the right thigh.

Aviation Safety Officer, P-2H (P2V-7): Patrol Squadron 17 is carrying the survival knife in a pocket with a heavy duty zipper on the right side of the flight suit between the hip and knee along the seam just clear of the thigh pocket.

D. R. Ayres, LT, Post Graduate School: (T2J, SNB, T28): I slip the sheath into the waistband which holds the Mk-3C and secure it to the right riser strap with two snaps. In this position the knife can easily be reached with either hand. When I am not wearing a torso harness I slip the knife into the sheath along the right thigh. *(With the knife and sheath positioned behind the Mk-3C retainer belt lift-the-dot snaps, windblast on the sheath during ejection can very easily disengage the snaps, thereby freeing the right side of the Mk-3C to "ride up." It is doubtful that two snaps could hold the knife assembly to the torso harness. The photo does not show a lanyard to prevent loss of the knife.—Ed).*



CO, VF-91: F-8C (F8U-2): This command designed the survival vest shown in the photos as an efficient method of mounting the survival knife in addition to providing means of carrying survival equipment. The depicted position of the survival knife on the life vest has proven to be a very convenient, comfortable and efficient location for this essential survival item on pilot's flight gear. The advantage of the knife's location in this position is that of being easily accessible by either hand under most conditions with no danger of inflicting injury to the pilot during an ejection.

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Safety Officer, VF-96: F-3B (F3H): The most important advantage of this installation is that it is accessible in the cockpit, during parachute descent, in the water and among trees. It does not interfere with normal cockpit operations. Even though the photo shows a righthanded installation, it is possible to remove the knife for use with either hand. It is protected by the arms and face curtain during ejection. One disadvantage is the possibility of it stabbing the arm during a high "q" ejection when the arms would be flailing. Mounted crosswise, it will not stab the stomach during a parachute landing.

(It seems that the wearer would have difficulty properly adjusting the integrated harness with the knife mounted in this position. —Ed.)

H. E. Laine, PRI, NAS New Orleans (endorsed by CO, NAS New Orleans): (F9F, FJ, S2F, TV2, SNB, T-34): Personnel in the Parachute Loft here have experimented with various locations for the survival knife. The latest method (as shown in the photos) is a specially designed knife pocket which is satisfactory for installation in several places on both the right and left side of the regular flight suit as well as on the anti-G suit worn over the regular flight suit. The basic items needed are a canvas top and backing for the pocket, a zipper and a hold-down strap. The tie-down strap secures the knife sheath inside the pocket permitting one-hand extraction. Some models of flight suits with the inside zipper allow the knife pocket to be installed further to the rear of the leg than shown in the photo. This does not require disabling the front pocket on the suit leg. The model shown in the photo requires closing of the pocket. When the pocket is sewn on the thigh of the flight suit, the knife is installed with the handle down to allow the wearer to draw the knife forward into free space while in a seated position. The methods shown place the knife in a comfortable position, out of the way and yet ready for action. If interest is generated among APPROACH readers, NAS New Orleans will furnish patterns from their metal templates upon request.

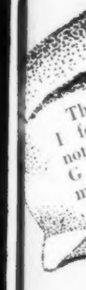
CO, HS-10 (endorsed by CVSG-51): SH-3A (HSS-2): With an NB6 (Back Pack), a summer type 11 flight suit or anti-exposure suit, in an SH-3A (HSS-2,) the survival knife should be secured to the outside right thigh of the flight suit or anti-exposure suit midway between the belt line and the knee, centered on the outside leg seam. The knife should be worn by all helicopter crewmembers in a leather sheath enclosed in a canvas pocket with a "dot" fastened flap over the knife handle. This particular location and design is considered to be best for *all* crew positions. The foregoing has the concurrence of the NATOPS' evaluator and is being recommended for inclusion in Section 104 of the SH-3A (HSS-2) NATOPS Manual.

CO, VS-41 (endorsed by CVSG-51): S2F-1/2/3: The sheath knife should be carried in a zippered canvas pocket designed with an inner flap to assure retention of the leather sheath when the knife is removed. The leather loop should be attached to the knife and wrapped around the handle in such a manner as to assure no interference during removal of the knife.

Sheath knives should be attached to the inner side of the lower left leg of the outer garment for right-handed pilots and aircrewmen and to the inner side of the lower right leg of the outer garment for left-handed pilots and aircrewmen. In flight suits where leg zippers are located on the inner side, knives should be worn on the outer side of the lower right leg of the outer garment for right-handed pilots and aircrewmen and on the outer side of the lower left leg of the outer garment for those who are left-handed.

In addition to the suggestions discussed elsewhere in this article and quoted in these pages, NASC also received letters from the following persons:

- LT H. M. Davidson, Albuquerque, N. Mex.
- John Conrad, HM2, Medical Dept. USNAS, New Orleans
- Irwin Patclif, ASO, VS-21
- Cadet Charles Benson, Miami Springs Cadet Squadron, CAPC
- LCDR D. S. Judd, Aviation Safety Officer, NavStaMid
- William J. Beahm, Safety Engineer, Flight Operations, North American Aviation



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Dear Doc:

Let me preface my answer by saying that, medically speaking, the business of flying is rigorous and requires that you be in the best possible physical condition. The only saving grace is that you can say upon mission fulfillment, "That's a job well done," and personal satisfaction is yours.

Hemorrhoids or piles are an occupational disease among flying personnel. I believe pilots have more hemorrhoids than any other group of people in the world except perhaps pregnant women, and theirs are generally temporary.

A hemorrhoid is nothing more than a varicose vein—a vein which has become incompetent due to pressure on it from above, which retards the return of the blood to the heart. As a result, the thin-walled vein (arteries are thick-walled) swells. The valves then become ineffective, and a whole column of blood drops to a weak area—in this case the lower rectum and anus.

Blood pooling in these large incompetent veins may or may not clot. If it clots, it is called a thrombosed hemorrhoid.

Hemorrhoids may be internal (in the rectum) or external(outside the rectum, at the anus), or a combination of both. Hemorrhoids may bleed if the vein is broken by a passage of a stool. One may be unaware he has hemorrhoids until he notes some streaks of fresh blood. Piles can be very painful due to the many pain receptors (nerve endings) in that region.

Regardless of the set of signs or symptoms you have, get to your flight surgeon pronto. Any rectal bleeding, pain, or palpable lump deserves expert consultation and study. Although hemorrhoids are not too serious, another very serious illness can present the same symptoms—so don't delay in getting to the flight surgeon.

Early hemorrhoids are generally treated conservatively. Late untreated hemorrhoids may require surgery.

You can help prevent hemorrhoids by good diet and regular meal times. Regular bowel habits are even more important. The large bowel and rectum dehydrate (remove fluid from) the stool. The longer the stool remains in the rectum, the larger, drier, and harder it becomes. This increases pressure on the veins and may cause them to tear.

Altitude flying is also very dehydrating. Therefore, drink at least eight glasses of water a day, as well as other nourishing fluids.

Try not to stay seated in a static position too long as this impedes circulation. Vibrations and G forces also impede circulation. While flying, flex your muscles frequently—particularly your feet, calves, thighs, buttocks, and anus. (Yes, it's a voluntarily controlled circular sphincter muscle).

Upon mission completion, get some exercise to get your blood rolling again. Massage your buttocks and legs. Avoid the cold. Prop your feet upon the desk or bar to utilize gravity to push the stagnant blood along.

A sitz bath several nights a week is also helpful. To do this, run a couple of inches of tolerably hot water in the tub, sit in it, and gradually increase the temperature by adding more hot water. Heat aids circulation by stimulating the blood vessels and brings into use your collateral circulation—other veins in the area that haven't been doing their share of the work. Stimulating the circulation causes the old stagnant blood to be carried away and replaced by healthy blood.

This is good advice, whether you don't have piles, have them now or once had them—they can recur, you know. If it doesn't solve your problems, see your flight surgeon, and he will tell you how to get a new problem by the definitive treatment of surgery. He may also give you some palliative medication and vein shrinker for application during the painful period.

Material courtesy of "Interceptor" August, 1962, and Lt. Col. Franklin P. Spiro, USAF, Tyndal AFB Hospital, Fla.

Full Pressure Suits

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A Frank Discussion of an Important Problem

in Perspective

LCDR N. K. Combs

Pilots and radar intercept officers of F4H and A3J squadrons are routinely indoctrinated in full pressure suits. In addition, the majority of F8U pilots have also been indoctrinated. When these dedicated officers leave the indoctrination unit they are, with few exceptions, enthusiastic and "sold" on the many areas of protection afforded by the suit.

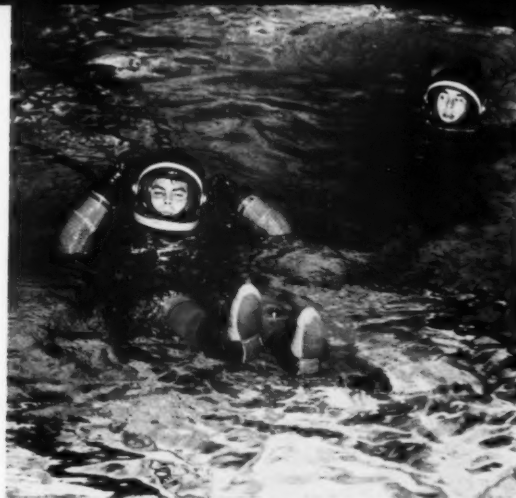
Therefore it comes as quite a surprise when it is learned that generally *the suits are utilized very sporadically in squadrons*. Suits were authorized for fleet operational squadrons more than three years ago—so it is appropriate that we bring them into perspective. In other words, why does squadron utilization leave much to be desired and what is the basis of the reluctance to fly the suits more?

First, let us review the full pressure suit itself, why it was developed and the definite protection it provides.

The primary need for the suit is protection of the pilot in the dangerous environment above 50,000 feet where everything is opposed to human survival. Understandably, no one disputes the necessity of the suit at such altitudes. Positive protection is provided against a decompression, bends, insufficient oxygen and the low ambient temperature. If this is not enough, excellent protection is provided for high speed ejections, anti-exposure plus survival on and under water. This is quite a bit of protection for one item of personal flight equipment to provide; so it could logically be expected that pilots would question it from time to time.

Perhaps it would be appropriate here to touch on the evolution of such flight equipment. Not everyone has the opportunity to get a look behind the scenes. We find a very dedicated group of civilian and military specialists devoting full time to improving aviators' personal and survival equipment, plus the development of new ideas. Testing of new or improved equipment is exceptionally thorough.

As an example, completed test work at the Air Crew



A pilot floats in his pressurized suit. Although the helmet visor is open the watertight seal around his face protects the suit's integrity. The pilot on the right has his life vest inflated.

A test subject wearing the Mk-4 full pressure suit escapes from aircraft cockpit underwater in test tank at the Air Crew Equipment Laboratory, Philadelphia.

Equipment Laboratory of the Naval Air Material Center, Philadelphia, would be followed by further evaluation and flight tests at such installations as the Naval Air Test Center, Patuxent River, Md., and Naval Parachute Facility, El Centro, Calif., under assigned projects by the Bureau of Naval Weapons. The results of such a test and evaluation procedure can obviously be relied upon.

Getting down to hard facts, just what benefits can the naval aviator realize from flying in the full pressure suit? Let us first consider the safety features and then give thought to other advantages.

Oxygen. 100% oxygen is supplied at all times and pressure breathing is unnecessary, even in a vacuum. Only a sealed capsule could equal that feature. And, an oxygen mask is not used.

Decompressions. These are disagreeable experiences. Reports from pilots indicate that confusion, disorientation and a thorough "shaking up" can be expected. These responses, coupled with the extreme low ambient temperature and pressure breathing at higher altitude place the incident in the "no thank you" category. *But when wearing the pressure suit* such an incident would be described as startling but without discomfort.

Pilots wearing full pressure suits receive underwater and drag device training at NAS Norfolk.

Anti-Exposure Protection. Innumerable tests have proved beyond doubt that the pressure suit affords excellent anti-exposure protection. Yet, this is a controversial area, especially among the misinformed. Over a period of several years the Navy and Air Force have conducted every conceivable test to determine the anti-exposure qualities of the suit. Some of these repeated tests were: one hour in 29° water, exposure to actual and simulated arctic conditions at 40° below zero for several hours and excursions into northern lakes during the winter.

The following statement by an Air Force captain who participated in a test of the Mk4 pressure suit at Thule Air Force Base in September 1960, borrowed from the USAF *Interceptor* is of interest:

"Mr. Don ...., representative of .... and I were TDY to the 332nd FIS, Thule AB, Greenland, for the purpose of fitting its aircrews with the Air Force Full Pressure Suit, type A/P 22S-3. There was some doubt as to the degree of protection this suit would afford in cold water. After a lengthy discussion, it was suggested that we take a swim in the bay to demonstrate the suit's capability. Further, the men suggested that only one pair of thermal underwear and boots be worn with the suit during this demonstration.

"Don and I dressed in our equipment, and arrived at the boat dock to find most of the squadron and the base flight surgeon with his ambulance and crew standing by, dressed in warm clothing and parkas. Don inflated his underarm life preservers and jumped in feet first. He looked comfortable, even though the outside conditions were 28-30° F. water temperature 30° F. air temperature, and 15-20 knot winds. Don suggested that I jump in without inflating my underarm preservers. A little apprehensive, but determined, I jumped. Much to my surprise, I bobbed like a cork. I was able to move around with ease.

"I swam toward a small iceberg and climbed aboard. It was a very unusual experience slipping around on a big ice cube that moved from side to side as I shifted my weight. Don then joined me, and we stretched out on our rather cool perch to see if we could feel the cold through our suits. We were not at all uncomfortable, and at the most experienced just a cool feeling.

"After about 25 minutes of exposure, the men on shore got cold watching us and called to us to come back in. Don jumped in and swam around while waiting for me to join him. I was asked by the men to dive in head-first to see if I could still float with my head up. I then dived in head-first and again came up like a cork and swam back to shore. We were examined by the men closely, until they were satisfied that we were dry and comfortable. Then we called it quits for the afternoon.

"It is this writer's opinion that this piece of equipment will afford excellent protection for our crews, should it become necessary to eject over cold water."

The full pressure suit referred to in the above statement is the Air Force version of the Navy's Mk4 suit. Waffle weave underwear is always worn with the suit for maximum anti-exposure protection.

In an official report an F8U-2N squadron made the statement that "The full pressure suit is considered completely adequate for use as an anti-exposure suit in terms of pilot comfort and efficiency." This was after the squadron had completed day/night CarQuals during the winter. A total of 281 trap landings were made—of which 96 were made at night.

Perhaps the greatest reason for utilizing the pressure suit for anti-exposure is the protection provided in so many other areas during day-to-day flight operations. *A conventional "poopy" suit provides protection in one area only.*

Water Protection. The suit is excellent in the water but its advantages are often misunderstood. First, it is definitely watertight. An improperly maintained suit or an open port will of course admit water. In respect to flotation, the suit was never intended to substitute for the life preserver. True, when air is trapped in the suit it will, like a "poopy" suit, provide some buoyancy. But regular flotation gear is required as usual in order to stay afloat. In the event a downed pilot has found it necessary to remove the headpiece (such as a delayed rescue) and water reentry should cause the suit to take on water, the flotation gear would easily keep him afloat. The safe rule is to never discard the flotation gear. Tests indicate that entry into a raft seems to be easier than with conventional flotation gear. It is less bulky in the waist area.

The underwater qualities of the suit are indeed remarkable. This advantage would be realized in the event of a "cold cat" shot or an over the side situation arising from non-arrestment on the landing. While submerged, vision is outstanding and available oxygen (aircraft supply or emergency) would facilitate breathing.

High Speed Ejection. This is a rare event but the suit can provide considerable protection. It will remain intact at supersonic speed and excellent protection is provided for the face and eyes. If ejection was initiated at an altitude above 45,000 feet, suit pressure would provide overall body protection and would decrease flailing.

Advantages in Combat. The primary reason for development of the suit, as stated earlier, was protection above 50,000 feet. Several of today's aircraft have altitude capabilities above that altitude. The suit is therefore mandatory if the complete flight envelope of the aircraft is to be enjoyed.

In some areas of the world the pilot is within minutes of such extreme ground conditions as snow-covered mountains, water, desert and jungle. Probably no other personal equipment could provide survival protection in all these conditions as the pressure suit could. In addition, the "complete the mission" capability of the suit could enable the pilot to return and fight another day.

Now it would be reasonable to ask what does the pilot pay for all this protection.

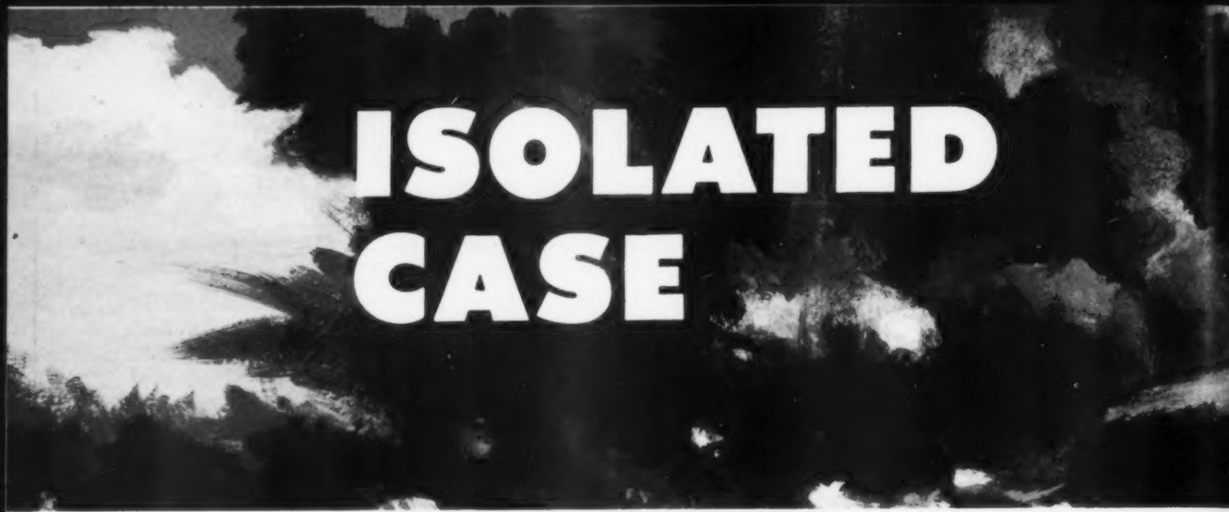
It *does* require a few more minutes to don the suit perhaps but about the same as a complete "poopy" suit. But the few minutes extra (an experienced pilot can dress in 10 minutes) might be a bargain for the protection gained. Interference with cockpit mobility is a pretty weak argument as suit pressurization is a rare event and doesn't occur under 35,000 feet aircraft altitude. Looking around and to the rear cannot be accomplished with quite the ease of non-pressure suit equipment.

It is the experience of some pressure suit training units that pilots are vague when queried as to why the suits are not used more. Few specific reasons are advanced. It has been noted that adverse rumors concerning the suit's qualities do have a disturbing effect.

The best opinion is that the transition to pressure suits is a marked enough change to bring about some hesitation. This is typical of the introduction of new equipment. Pilots are understandably cautious and unabashedly critical of new personal equipment, especially if it might be encumbering.

Since the full pressure suit can be an asset for the combat ready pilot who considers himself prepared for any mission, he must be thoroughly familiar with the suit as part of his weapons system.

LCDR N. K. Combs, MSC, has known naval aviators and their aircraft from N2S *"Yellow Perils"* to present *Phantom IIs*. In eight years he advanced from Apprentice Seaman through Chief Pharmacist's Mate to Warrant Officer. During World War II he was in the South Pacific including Guadalcanal. He graduated from Lake Forest College in 1948 and earned his Master of Science in Physiology from Northwestern University in 1949. Commissioned a LTJG in 1949, he has had duty at air stations in Denver and Atsugi, Japan. He reported to the Naval Air Test Center, Patuxent River in 1958 as aviation physiologist and project officer for aviators' equipment. Since December 1959 he has been aviation physiologist in charge of NAS Norfolk's physiology and full pressure suit training unit.



ISOLATED CASE

Just what is an "isolated case" in reporting an aircraft mishap? Circle the correct answer/answers.

1. A mishap that has never happened before in *your* squadron.

2. A mishap that *you* have never heard of happening.

3. A mishap that the odds are 100-1 against.

4. A mishap that the odds are 1000-1 against.

5. A mishap that you don't see a quick answer for.

6. A mishap that will get a little "sticky" if you go into it too deep.

7. An act of God.

Let's examine the answers one by one.

1. It has never happened in your squadron before. Are you sure? Do you know how many times it happened or almost happened but the pilot (or mech) forgot about it or thought it best to keep quiet?

2. You have never heard of it happening. Is it because it never happened or maybe because it (like no. 1 above) wasn't reported or perhaps you didn't read the "pubs" where it was described.

3. The odds are 100-1 against it. Just consider the hundreds of flight hours flown by each Marine Aircraft Group.

4. The odds are 1000-1 against it. Consider the thousands of flight hours flown by each Marine Aircraft Wing.

5. You can't see a quick answer. This is usually the most insidious type because if you can't others won't, and until we lose a pilot and/or aircraft it may remain an "isolated case."

6. It may become "sticky" if fully investigated. This is a problem Safety Officers sometimes have to live with. However, if you have done your job properly and sold the Aviation Safety Program to your skipper, he will be just as anxious as you to get to the bottom of things.

8. An act of God. Once in awhile, even after exhaustive investigation there is no explanation for mishap; this, then, is an "isolated case."

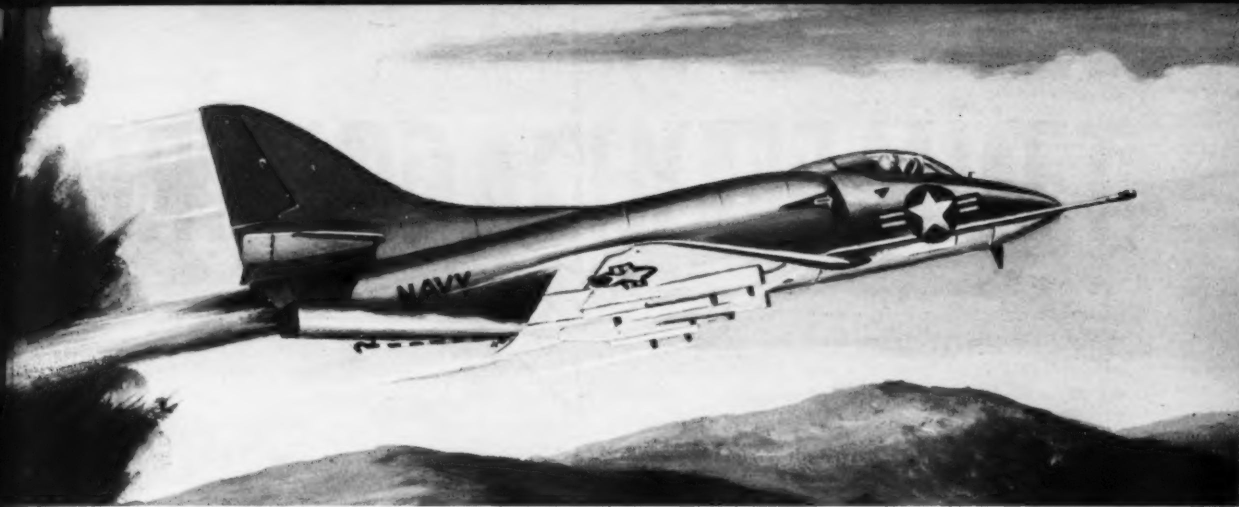
Now you ask yourself why all this explanation to tell you something you already know. The answer is that looking over recent Aircraft Incidents, Flight Hazards and Ground Accidents we find there are some ASOs who don't know, or have forgotten, or don't realize, or just won't admit to themselves the importance of a thorough investigation and report. Accidents are usually preceded by certain sign posts. The incidents, hazards and ground accidents often establish these sign posts and indicate to us the proper road towards preventing accidents. The only signs the "isolated case" really gives us is that the ASO is doing his job. The Aviation Safety Program is not up to snuff and the squadron is living in an accident producing environment.

Here are a few thoughts about a very recent *Isolated Case* encountered on a strafing hop which luckily only resulted in a badly shattered wind screen and a large hole in the wing.

The comments and recommendations said, in effect, that:

• The flight was briefed in accordance with squadron SOP. The SOP calls for 400 knots, a 20-degree dive angle and firing 1500-1200 feet range from the target. Pull-out is to be initiated 1200 feet from the target so as to pass of over it at a minimum altitude of 100 feet.

• Although the pilot fired inside the outlined pull-out for the original target, he had initiated his pull-out. While leveling off, he continued to fire into the



general target area beyond the initial target. The minimum pullout was not violated. *(He was down there by himself while the rest of the flight was orbiting)*

- Random, blast fragments are always a remote possibility on low angle gunnery runs such as this.
- This incident is considered to be an ISOLATED CASE (ed's upper case letters) and as such, only the following recommendation is made.

> For the general knowledge and safety of all pilots, it is recommended that Squadron Standardization Officer continually reemphasize the impressive closure rates, times, and altitude during all air to ground ordnance missions.
>
> The CO concurred and said they would do it.

This report tells us nothing and appears to have been written only because a report was required.

The Group endorsement said the primary cause factor was supervisory in nature in that the squadron SOP was in conflict with the group SOP for operations which establishes 300 feet terrain clearance as the minimum pullout altitude for strafing attacks.

The following are a few recommendations and considerations the editors think might be worthy of note. You can probably think of a few yourselves. The target was in a "lava rock" area so we might suggest a recommendation that all pilots must be made aware that the danger of richochets and flying debris is directly proportional to the hardness of the target and the surface material.

The SOP gives firing point and pull out point in slant range. In a low level, low angle run, slant range is difficult to impossible to determine. Since a 20-degree dive is to be maintained it would be easy to convert slant range to altitude and then emphasize the dangers of flattening the run.

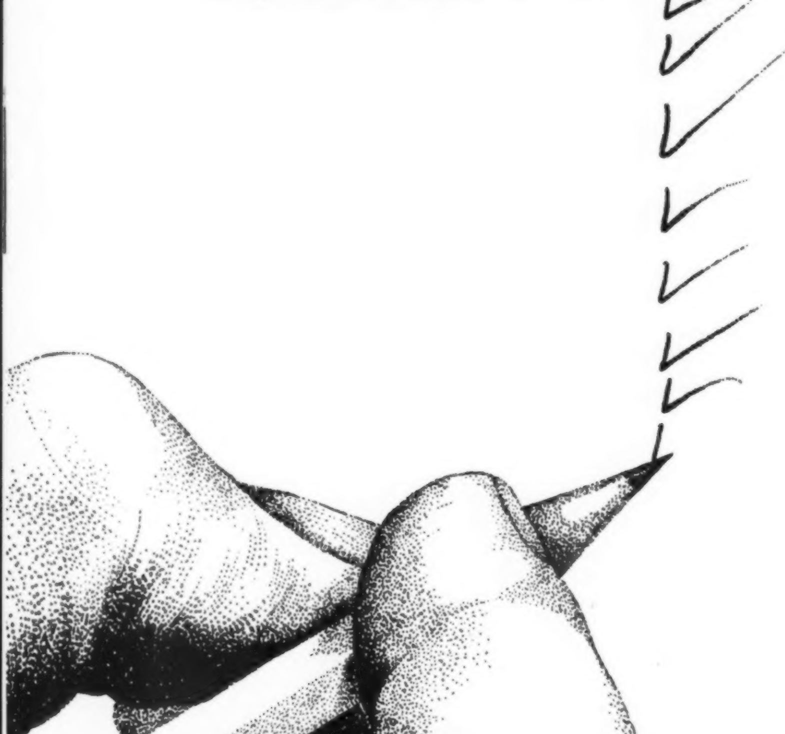
The pilot states he used a 2-G pull-out. A sharper pull-out might also avoid the flying debris. The pilot also admits firing into a slant range of 500 feet and flattening out his run. He was putting himself in a corner—the coffin corner. In his attempt to "fire out" he carried his run too close and too flat. Pilot was not considered a factor in the report.

Then there was the case involving a generator turbine failure. One of the comments said, in effect, it is felt that this was a case of simple material failure. There is no specified time life of the subject unit and this is the only similar type failure experienced in this unit. It may well be an *isolated instance*. There were no recommendations made. The comment itself would suggest a recommendation that a study be made to establish a "specified time life of the subject unit." This also is not an *isolated instance*. There have been eight generator turbine drive failures involving safety of flight since July 1960. One strike, one overhaul and substantial damage has been reported. The Naval Aviation Safety Center, we believe is after a cure for this failure.

The above listed incidents may indicate a need for more positive corrective action on the part of the squadron or a more thorough investigation by the Safety Officer. We believe a more thorough investigation would have revealed the areas of corrective action, since one of the above incidents was repeated a couple of weeks later in the form of an accident.

P.S. The mishaps described happened in other Commands, therefore we don't have all the details. There may be circumstances of which we are unaware. The article was written strictly on how it appeared to us by reading the reports.. *—3rd MAW "Hot Mike"*

QUALITY CONTROL



By F.M. Sullivan PRCS

Parachute packing begins with lowering the chute from the drying loft.

Inspection of the parachute canopy is an important part of a good quality control system.

In many cases, packing procedures are contained in the HMI of the specific aircraft model.

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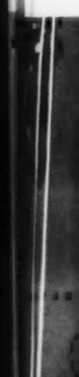


IN THE PARACHUTE LOFT

Should we have a quality control system in our parachute lofts?

Many a parachute rigger will say that we have some type of a system now. However, have you, as the supervisor, taken a good look at your loft's packing procedures lately? Sure, your squadron has a QC system at the hanger and it's a fine program. On the last AdMat inspection the division got a 95.6 final mark, the maintenance officer congratulated all hands, and the division officer bought a round of beer for all the PRs.

The QC inspection in the hangar for a chute that is completely packed is not much of an inspection for parachutes; all that the QC inspector is able to observe is the outside container. What is the condition of the parachute inside? Unless the inspector has X-ray eyes like Superman, it may be a week's laundry that was intended to be washed during last duty night by the rigger. This is greatly exaggerated and not very funny for equipment that the aviator must depend upon on each flight. But the point is this: we need a quality control inspection at the packing table more than at the hangar.

We don't intend to discredit the hangar QC system's importance. Quite the opposite is intended. This QC is most important for equipment such as ejection seat drogues, oxygen equipment, emergency bailout equipment, . . .

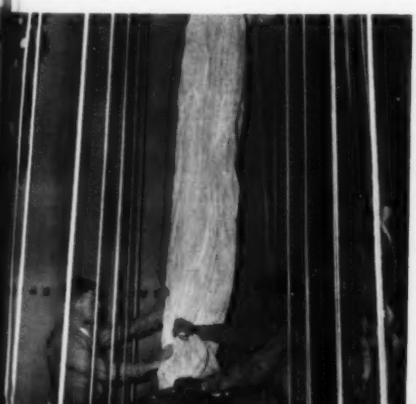
Why is it we have such a good system at the hangar area and forget the parachute loft? The fleet operating squadron flying high performance aircraft equipped with low level capability ejection seats is the unit in which this system is most lacking. For instance, squadrons flying A4D aircraft have an allowance of 3 parachute riggers. If the unit has 2 riggers, it considers itself lucky.

In addition, the situation is such that during the squadron's stay aboard an air station, which does not have the integrated central loft concept, the senior rigger delegates two men to pack the squadron's chutes as they come up for repack. The men assigned to the chute packing attempt to keep abreast of the latest publications; however, the publications do change at a fast pace.

New parachutes are assigned to specific aircraft, and many chutes are not packed in accordance with standard procedures learned during "A" school instructions. These packing procedures in many cases are contained in the HMIs of specific aircraft models. Never before has the parachute rigger had to depend upon the HMI for packing instruction.

The old axiom "things change" applies more to parachutes than most PRs realize—unauthorized methods of packing chutes that have been passed down through the years no longer have a place in the present Navy.

With a low-level ejection seat a fraction of a second is most vital to the pilot ejecting on the runway with



110-130 knot airspeed. It is imperative that all emergency equipment function exactly as designed, that the automatic chute opener fires and operates correctly, that the canopy deploys with a minimum of lost time. The storage of shroud lines must be placed in hesitator loops within specified tolerances with no more protruding than is allowed under the latest instruction contained within the maintenance instruction manuals.

In addition to new and changing procedures of packing, the equipment is becoming more complex, making it impossible to remember the many steps to perform before the outside packing data card is signed.

The auto chute opener is the very heart of the low altitude ejection system if the seat is not a Martin-Baker type. Has the actuator been assembled correctly and carefully in the proper manner? Is the leaf springs assembly in the correct order? The correct cartridge installed within the Master Specialties actuator? These are only some of the problems that can and have occurred within parachute assémblies. Have steps been instituted to prevent them from recurring?

The fact that 120 aviators successfully ejected last

The parachute rigger's helper and the quality control inspector follow check sheet procedures to verify the parachute rigger's work. This reduces the posibility of human error.

year makes the PR's chest swell with professional pride to think that parachutes lowered these pilots safely to earth and they were able to fly again. The ejection message report under "Mike" column, "all emergency equipment operated normally," is music to the ears and we can't help thinking that another rigger's equipment was put to the final test and the PR and equipment "operated normally."

However, it is appalling to read an accident report in which the actuator leaf springs are assembled in inversed order or the parachute skirt hem was folded in an unauthorized manner, not in accordance with the latest handbooks, or that gage pins still installed on modified actuators, precluded operation of the actuators. These things do occur and will continue to occur until a check and recheck system such as Quality Control is instituted within the paralofts.

Such a system, no doubt, will bring about many problems, such as, who shall control it, how many men will be required to maintain the program and many others too numerous to mention. The obvious answer is the central integrated loft concept such as already exists at NAS Oceana, NAS Cecil and NAS Miramar.

In order to properly maintain a good quality control system, the air station must have the central loft concept. Generally an air station has only one parachute loft aboard. Allowances for air station parachute riggers are based on station workloads only and not for services of this type; that is the reason for the

Inspection Team

"This accident precipitated the action whereby Commander, Fleet Air, ... has established a program to send a team composed of staff members and factory representatives to all applicable squadrons in the FAir............. area for the purpose of conducting inspections of ejection seats, and associated equipment, in order to reveal maintenance malpractices, to determine if all of the latest changes have been incorporated and to insure a satisfactory level of knowledge of the seat on the part of maintenance and flight crew personnel. This program has been excellently received by the squadrons concerned, and its expansion within the naval air organization is highly endorsed."

From an AAR

Escape equipment is becoming more complex. This makes it impossible to remember the many steps to be performed before the outside packing data card is signed.

central loft concept. From all squadrons must come specific numbers of riggers in order to properly perform the assigned mission. From this pool of personnel can come your quality control inspectors.

The central loft must have the backing of the station commanding officer with aggressive orders or instructions dictating policy of assigning personnel from the squadron into the station loft in order to maintain allowances of qualified personnel. The system is not easy to set up and operate and requires positive action and many hours of paper work. The system can, does and must work in order to maintain continuity of our packing procedures.

To implement the QC system there is a need for a check sheet program utilized both by the packer and the QC inspector. In this article we will discuss parachute check sheets only and will not be concerned at this time with the other emergency equipment check sheets.

The parachute check sheet should be used for all parachutes including the Martin-Baker chutes. At the present time, many lofts are using locally devised check sheets to guide parachute packers as well as the local QC inspectors during the packing phase. There

To implement Quality Control, a check sheet program should be utilized both by the packer and the QC inspector.

All Mixed Up

Does your squadron have BACSEB 22-61* and BACSEB 38-61* installed in only a portion of its Martin-Baker ejection seats? If so, it is extremely important to remember that the modified parachutes *are not* to be interchanged with the unmodified seats.

As stated in BACSEB 38-61, ". . . the installation of the personnel parachute anti-squid lines will be applicable only after incorporation of BACSEB 22-61 which authorizes the original anti-squid line installations as part of a seat modification program."

Ensure that there is no mix-up. Rigid adherence to existing BACSEBs is imperative. Any deviation from the existing instructions could very well compromise the good working order of this life-saving piece of equipment.

*BACSEB 22-61:
Martin-Baker Mk-5 seat escape systems; modifications to improve low-level performance

*BACSEB 38-61:
Martin-Baker Escape System (Integrated Type), main parachute assembly; installation of personnel parachute antisquid line, and inspection and packing instructions.

Parachute History Cards

All parachute history cards should be signed immediately on completion of repacking procedures.

Inspection of a parachute history card with a chute used in a recent successful ejection indicated that the chute was 29 days overdue for repacking when jumped. Investigation showed that the chute had been repacked on schedule but that the parachute history card had not been signed off properly through administrative oversight.

In accordance with the recommendations submitted by the investigating officer, the squadron flight equipment SOP has been revised to specifically insure that parachute history cards accompany chutes during repacking and are signed off by the packer immediately after the chute is repacked. Stringent inspection procedures have been instituted to insure that all parachute history cards will be properly signed in the future. The squadron suggests, and the Naval Parachute Facility concurs, that one of the two packing data cards be affixed to the portion of the parachute which remains with the pilot upon ejection.

must be a check sheet for parachute packing as well as for the automatic actuator. This sheet should include such items as check applicable instructions, inspect cartridges for proper color codes, distance or amount shroud lines protrude through hesitator loops and many more items that can be taken from existing instructions.

As one barometric actuator record sheet given this writer indicated, "The parachute rigger's helper and the quality inspector will follow the check sheet procedures to verify the parachute rigger's findings to preclude a possibility of human error."

This is the program in a nutshell . . . To check and recheck to preclude a possibility of human error is the only answer to the problem.

The parachute riggers have that certain feeling of knowing when and if their equipment is utilized, it will perform "normally." We have always had this professionalism within the rating from the time we were required to demonstrate our abilities with a parachute jump at "A" school in the pine tree country of New Jersey, through the first time our equipment was used in an emergency situation. This professionalism was apparent and all other men in the Navy knew and respected this quality. This emergency equipment is the Navy flyer's last chance after all other flying machinery and equipment has failed him. He then places his life in the emergency equipment and in the hands of the man who maintains the equipment.

Over 1100 emergency bailouts and ejections is a good record of successful escapes during the last 10 years. We must keep on the alert to insure this record is maintained and continually improved within naval aviation and the rigger's rating. We accomplish this task through a quality control system and check sheets during the parachute packing procedures in the loft. Institute this program in your parachute loft; maintain and insist upon only the highest skills and professionalism.

Let's not fail the aviators with poor or improper maintenance. Others have small room for error, the parachute riggers have none. ●

Inspection Sheets Wanted

Copies of local inspection sheets covering all survival equipment are desired by the Naval Aviation Safety Center. Purpose: to obtain data in order to establish a standardized BuWeps Manual of Inspection Requirements. Please mail this information to: Commander, U. S. Naval Aviation Safety Center, Norfolk 11, Va.

Seals of Quality Assurance

VF-124 has come up with a new wrinkle in the never-ending effort towards absolute reliability of the Martin-Baker ejection seats installed in squadron aircraft.

Several of the seat mechanisms and fittings, some of which contain explosive charges, must be wired in accordance with the Maintenance Instructions. New Martin-Baker seats, as well as those overhauled have the twisted ends of seal wire joined by a stripe of brittle paint, which serves as a seal. Presence of intact paint seals thus indicates that the explosive charges have not been disturbed subsequent to installation.

Periodic inspections and other cases of disassembly of seat components require removal of the wire and paint seal. In the reassembly process, VF-124 affixes lead seals to the new wire with special pairs of pliers. These tools (Press, Lead Seal FSN G-5130-301-1078) have distinctive inserts in the pressing faces, so that numerical impressions are made on the seals. Since each designated quality assurance inspector has his own numbered tool, when he places his stamp of approval on the finished assembly, it remains impressed in lead, assuring pilots and supervisors of the integrity of the component.

Wire and lead seals are used in the following locations in the Martin-Baker ejection escape units:

- Primary firing head
- Upper secondary cartridge
- Lower secondary cartridge
- Guillotine firing mechanism
- Drogue gun barrel
- Time release mechanism "G" plug
- Time release mechanism barostat
- Time release mechanism inspection cover
- Drogue gun trip rod "PIP" pin
- Time release trip rod "PIP" pin
- Top latch mechanism

Quality assurance measures cannot succeed without knowledgeable and conscientious application of these measures by maintenance personnel. It follows that a measure of quality assurance is achieved by placing these lead seals in the hands of knowledgeable and conscientious individuals—the designated inspectors.

Close-up of "Press" lead seal tool and imprinted lead seal.

W. R. Smoot, AMS2 applies his personal quality control stamp to the Martin-Baker guillotine firing mechanism in the presence of LT J. J. Errickson.

57

Flexible Hose Care

TEFLON-lined flex hoses are extensively used on and around the engines on many of our aircraft. The selection of Teflon as the lining material for these hoses was made because of Teflon's particular characteristics. It is tough, flexible, easily cleaned, unaffected by virtually any foreign substance with which it might come in contact in an aircraft installation. It is a plastic which has good resistance to heat, and has unlimited shelf life.

Mishandling during maintenance operations can damage Teflon-lined flexible hose. It is particularly important, therefore, that personnel handling these hose assemblies be acquainted with proper handling characteristics.

Teflon, as compared with most other lining materials in tube assemblies, has a limited capacity for taking sharp bending; manufacturers of the Teflon-lined hose assemblies are careful to specify minimum bend radii. There are, however, some installations where the bend radii have been exceeded. These hoses may have been initially fabricated by the vendor under controlled conditions and are, therefore, acceptable. Most installations, however, have been designed to avoid sharp bends, or the line bends are accomplished with elbows and certain other tube end fittings.

Teflon, when subjected to sufficiently high heat in service, may take a degree of "set." It is then somewhat less capable of withstanding excessive bending. Such a tube or hose can remain in service, but it can no longer stand the same amount of bending without damage. For these reasons it is advisable to treat Teflon-lined hose assemblies as though they were never meant to be bent.

Following are some practical points on how Teflon-lined hoses may be handled to best advantage in maintenance operations.

- Whenever a hose is to be removed or reinstalled, the tube shank hex should be held with a wrench, while a second wrench is used to loosen or tighten the attaching nut. This prevents the Teflon liner from being twisted. The possibility of damaging the Teflon liner is greater with the shorter hose lengths . . . there is less length to absorb the twisting action.
- Tube assemblies—removed, or to be stored—should be left in the shape in which they are formed, with no attempt being made to straighten them, or to fold them.
- Tube assemblies, before installation, should be placed outside the work area to avoid possibility of crushing. Dropping should be avoided, not only to prevent bending, but to preclude damaging the end fittings.
- Tube assemblies with elbow and straight-through end fittings should be installed by attaching the elbow first. Similarly, with swivel and straight-through ends, the swivel end should be attached first, but not torqued and secured until connection has been made, and correct alignment established. Thus, it will not be necessary to twist the tube to obtain alignment with the elbow or swivel.
- Standard Teflon fuel and oil line assemblies have a woven wire cover. In some installations, a heat shield is placed over the regular woven wire covering. After using the foregoing precautionary steps, it is advisable to press the length of the heat shield with the hand to feel if the line underneath has been inadvertently twisted or kinked.

—Convair Service "Newsletter"

Cockpit Troubleshooting-T58

A TROUBLESHOOTING pamphlet recently developed by the manufacturer of T58 engines is available and is recommended reading to operators of T58 powered equipment.

Its color-coded charts facilitate analysis of engine conditions and lists probable cause(s) and action to be taken. Emphasis is placed on properly interpreting the engine gages so that an operator can recognize controllable malfunctions and react properly immediately.

The pamphlet includes a discussion of basic engine operating characteristics to aid those with limited jet experience and may be helpful as a refresher to the more experienced.

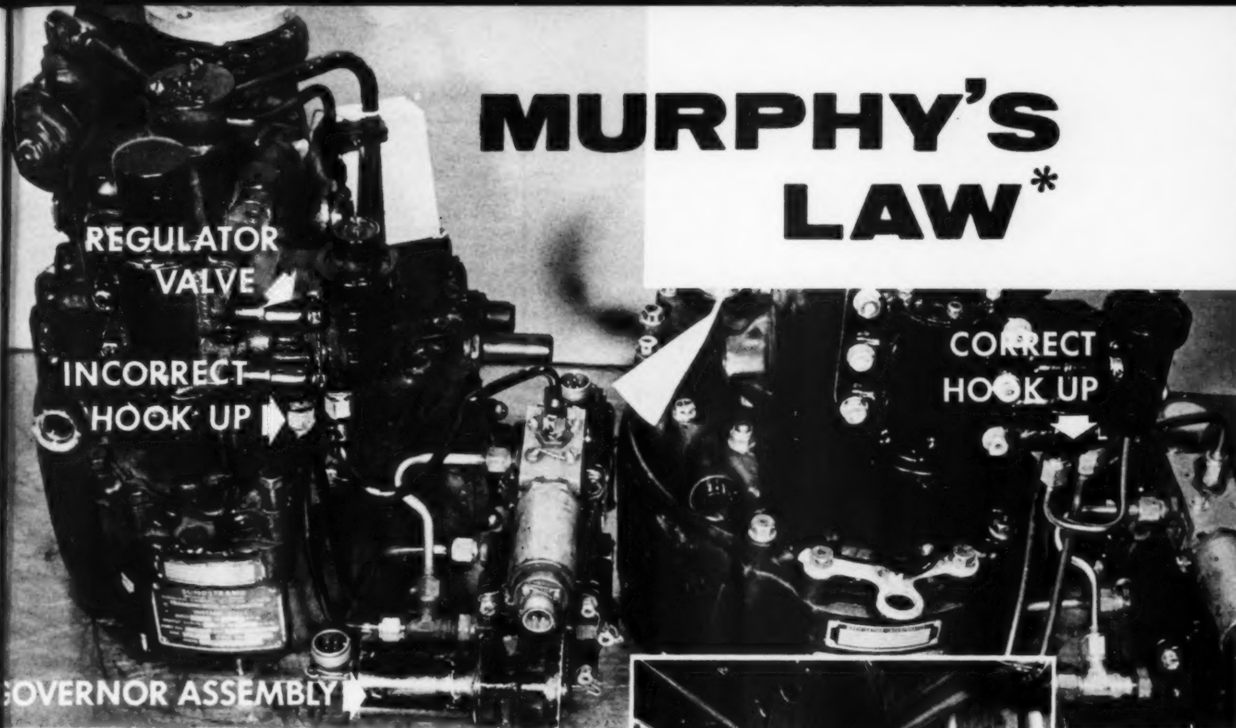
Copies of "Malfunction Analysis From the Cockpit" may be obtained free by writing:

General Electric Co.
Technical Training School
Small Aircraft Engine Department
1000 Western Avenue
Lynn, Mass.

From a Ground Accident Report (Flight Deck Crunch):

"The yellow shirt responsible has been issued a blue shirt." Not disciplinary but effective.

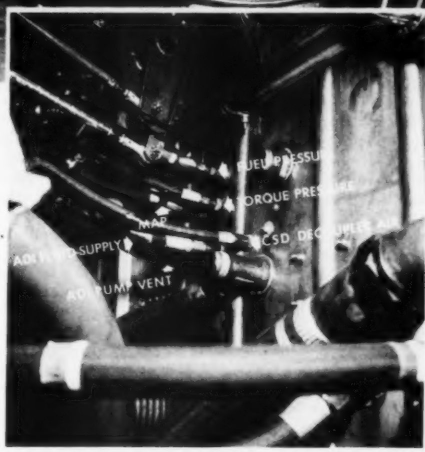
MURPHY'S LAW*



By LTJG Jack Wiggins, VP-48

Recently we experienced a Murphy in P-5B (P5M-2). Of all times, it occurred during the O.R.I. Hydraulic lines for the constant speed drive governor were connected to the wrong fittings on the regulator valve. When the engine was turned up a fire in the constant speed drive compartment occurred which, except for the alertness of the personnel at the aircraft, could have caused the strike of an irreplaceable P-5B.

On *another* P-5B we discovered that the pneumatic line for the decoupler had been connected to the ADI pump vent on the carburetor and the water pump relief valve vent to disconnect unit. *See inset for plumbing details.*



It is the responsibility of all who perform maintenance to know the correct installation and recheck their own work for errors prior to calling in Quality Control. Production personnel must not assume that Quality Control will catch all mistakes. When such an attitude prevails it may be noted that Quality Control is excessively burdened by long drawn out inspections and pointing out errors. Also, as the pressure increases to get the aircraft released for flight, the possibility of a maintenance error will also greatly increase.

Aircraft availability percentages mean very little if gained from shoddy, sloppy and unsafe practices. The smallest detail goofed up during routine maintenance can cause terrible consequences. With complex aircraft and systems we cannot substitute quantity for quality if we are to fulfill our assigned mission safely and effectively. It has been said "You can have quality *or* quantity, but you cannot have quantity *and* quality." Whether this statement is true or not is a measure of effectiveness of your maintenance program. ●

*If an aircraft part can be installed incorrectly, someone will install it that way!

> **Holiday Leave**
>
> Pilots returning from holiday leave should be given refresher OFT hops in emergency procedures. Their first flight should also be in good weather. Give them every break to get back into the routine of things the safe way. Do not let an accident mar your squadron's holiday period.

LETTERS TO APPROACH

Incentive Awards

NAS Norfolk—Why, if "Beneficial Suggestions are ideas to build a better Navy in less time and at less cost to the taxpayer," are Navy military excluded? I believe the following method, if adopted will add new incentive to the program:

If an estimated savings of 5000 man-hours per annum can be achieved as a result of adopting the suggestion: Advance the man in rate if he is qualified in all respects for his rate and the suggestion is in the field of his professional knowledge. For each additional 5000 man-hours per annum saved, award Pro-Pay P1, P2, and P3.

If suggestor is not qualified for advancement, or the suggestion is not in the field of his rating, award Pro-Pay P1 for 5000 man-hours saved per annum, P2 and P3 for each additional 5000 man-hours saved per annum.

At $2 per hour a savings of $10,000 per annum would be realized for each 5000 man-hours saved. Advancement in rating or Pro-Pay would cost about $360 per annum. A savings of 5000 man-hours is a bargain for $360. Adoption of this suggestion would put new incentive in the program by spurring military persons to put their thoughts on paper, rather than sit around and gripe about the fouled-up condition.

YNC

• This suggestion was forwarded via official channels to BuPers. Here is the official reply.

"The Navy considers that the introduction of incentives, such as advancement, would be inconsistent with and a reflection upon the sense of duty which should activate military personnel to seek ever higher standards of organizational efficiency. All suggestions for improvement made by military personnel are recognized by appropriate entries in fitness reports, service records and, in exceptional cases, by letters of commendation.

"The above methods are a command responsibility, and when properly utilized, should be in all respects satisfactory. The Navy is of the view that placing military personnel on the same footing with civilian personnel tends to destroy one of the primary ideals of military life—that unremunerative service is an end in itself and that duty well done is its own sufficient reward. This concept has been proven most effective by centuries of experience in many military organizations. Any measure which tends toward commercialization of the dedicated service ideal is believed to be a mistake.

"The principle of granting advancement in rating or pro-pay awards to military personnel for suggestions, management plans, operations, and other matters within the line of dedicated performance of duty, represents a significant departure from the duty concept of the military organization. It is felt that this principle lends itself to a misleading picture of the benefits to be gained by the extension of incentive awards to military personnel. It assumes that because they are not presently paid for suggestions military personnel have no incentive and therefore submit no proposals to increase efficiency or save the Government money. On the contrary, it is considered that all worthwhile and major suggestions for improvement are being submitted by the military in the course of performing their assigned duties."

"Creative Brainpower, the Navy's Latent Source," page 13 adds some fuel for thought on this same subject.

> **APPROACH welcomes letters from its readers. All letters should be signed though names will be withheld on request. Address: APPROACH Editor, U. S. Naval Aviation Safety Center, NAS Norfolk, Va. Views expressed are those of the writers and do not imply endorsement by the U. S. Naval Aviation Safety Center.**

Misdirected Missile

Key West:—The loss of an A-1H (AD-6) might possibly have been avoided had an aircraft-to-ground intercom been adopted as per my suggestion to the Office of Naval Research. It would have satisfied the accident board's statement, "The one thing that probably would have prevented this accident would have been the communication of intentions between the pilot and the flight deck personnel."

This development was for greater efficiency; a means for the pilot to discuss inoperative equipment, request ground crew to make additional checks, better coordination in general during the starting and checking out of launching aircraft.

ONR rejected the idea as being of insufficient importance and too costly to patent. Although my estimate may be off somewhat, I believe most of the single engine aircraft on one coast could have been equipped with this installation for the cost of the single loss, much less the cost of additional damage since. Cost of this installation would amount to about $5 and the intercom amplifiers might cost less than $100 each. Thus, on the basis of one amplifier for six aircraft the cost for an 18-plane squadron would be in the range of $500.

Further, ONR stated that the idea had "been evaluated on a Navy-wide

basis". I have asked the pilots of 10 different activities if their unit had been consulted. All of them stated in the negative and none failed to endorse the desirability of such a facility. Possibly NASC also was eliminated from the survey.

The first paragraph of the ONR letter is a form statement (I have quite a few letters all starting the same way) that does not correctly state my intention. At no time was it considered that the idea was patentable. It was submitted as a normal modification to make greater use of our electronic abilities. If the plane director could plug into the side of a plane and talk the pilot into position, it certainly would prevent the conditions that lead to the loss described in APPROACH.

This letter has been written not in a critical sense but in the sincere belief that adoption of such communications will improve efficiency.

Enclosed is a copy of the suggestion together with all correspondence for your consideration.

It is requested that my name be withheld.

ATCM

• Admire and appreciate your determination! No doubt that aircraft-to-ground communications would improve efficiency. Since you are not after a patent it appears your suggestion was sent to the wrong office. It should have been forwarded to Chief, Bureau of Naval Weapons, Attn: RAAV (Avionics Branch) for consideration.

Two-Man System

San Francisco—My squadron, and most safety-minded organizations, follow the correct procedures for the packing and inspection of parachutes. But it has been my experience to witness certain Navy and Marine Units that fail to practice the safety standards of our services. They do so by allowing their flight equipment personnel to use the one-man, short-cut, packing system made possible by the Martin-Baker parachute.

As a witness to this system I feel it is very dangerous. It is mandatory, in the packing of any chute, that we have the presence of two riggers. This employs a system of checks and balances, and eliminates, almost entirely, any chance of malfunction in a parachute.

My solution for the wiping out of this problem would be an order which requires two men and two different signatures on the record cards in the Martin-Baker parachute.

R. R. CHASE, LCPL USMC
VMF(AW)-451

• Although no official reference can be found stipulating the two-man packing procedure, all PR training manuals and the PR school at Lakehurst teach the two-man packing system. The one-man system may have to be used in an emergency. NASC is recommending to BuWeps that a system of check sheets be established to standardize packing procedures. (See article "The Parachute Loft," p. 52, this issue.)

Cooking Oil Cans and Detergent Cans

Midway Island—We have had two occasions which have come to the flight surgeon's attention where cooking oil and liquid detergent have been carelessly confused by cooks in the preparation of food. Fortunately the taste of pancakes, eggs, etc., prepared with liquid detergent is so foul that no one had eaten more than a couple bites. Just this amount, however, was enough to produce nausea and vomiting. That this error could be made between liquid detergent and cooking oil was aided greatly by the identical appearance of the plain metal quart cans in which the two liquids are issued, the only difference being the black printed labels (see photographs).

In September, a crewmember charged with preparing the chow for the crew of a WV2 flying the track from Midway to Alaska discovered to his amazement he had in his hand a can of liquid detergent instead of cooking oil. This incident further supported this flight surgeon's impression that action was needed to prevent further mishaps.

We at this facility have taken local action including spraying with red paint the tops of all cans of liquid detergent prior to issue, and we are making recommendations through the USNS Supply Officer that a basic change on a Navy-wide basis be made to eliminate this dangerous similarity.

Until such a change can be effected, galleys and crews who prepare their food in flight must pay extra heed to the danger and must take measures adequate to prevent the mixing of the two cans.

H. H. HARKINS, LT, MC,
Flight Surgeon AEW BaRonPac

FOD Prevention

Jax—Foreign object damage is an ever-present problem in the operation of jet aircraft, and the 'Roadrunners" of VA-36 have instituted a control program which is showing marked results.

At irregular intervals an item with foreign object damage potential is intentionally placed in the line area where the squadron's aircraft are parked. The man who discovers this hazard before flight operations begin is rewarded with a 24-hour special liberty. Policing the flight line has become an interesting task and considerable amounts of foreign objects are collected every day by men hoping to find the magic item.

The first eagle-eyed lineman to receive this award was Robert Nutt, AMH3.

R. L. GANDT, LTJG

For Logging Cat Shots

FPO-San Francisco—This doesn't concern a direct flight or ground safety hazard, but indirectly it is as important as anything else. Logbooks can also get hit with that glaring spotlight of infamy occasionally.

Today ours did. We were to screen the books to find out the total number of "cat" shots the planes have on them. And that can be a job, I'll tell you. Especially since any light traveling outfit that's squared away will throw away anything they can.

Staring us in the face were just the flight sheets since the last PAR, as per instructions on the separator card 418-6 and in BuAer Inst 13090.1 with changes thereto.

So I recommend that a column be provided in the flight section to distinguish between carrier arrested landings and morest landings. Also appropriate changes to the OpNav "A" record card and the OpNav "Y" report.

I further recommend that the history section 418-6 be revised to include appropriate spaces for total landings during each period or tour (broken down to type).

ANYMOUSE

• Looks good from here—supporting your thinking is this excerpt from a msg involving the development of a fuel leak in an

A-3B (A3D-2): "Aircraft had 97 cat shots since incorporation of . . . , 40 since last inspection and 20 since hard landing. It is believed hard landing tore one or more fuel cell hangers loose and subsequent cat shots caused additional damage to fuel cell."

Inasmuch as hard landings are among our greatest sources of material failures, stresses of cat shots and arrestments undoubtedly contribute to incipient failures. Such information should prove invaluable in establishing design, operation and service life criteria.

It appears that Column "O" of the Y section (OpNav 5442.14) which is for special uses as directed by the Chief of Naval Operations or the controlling custodian is a good place to start since no new forms would be needed. As for changes to 13090.1 your suggestions have been forwarded to the appropriate authority for consideration.

Wants Feedback

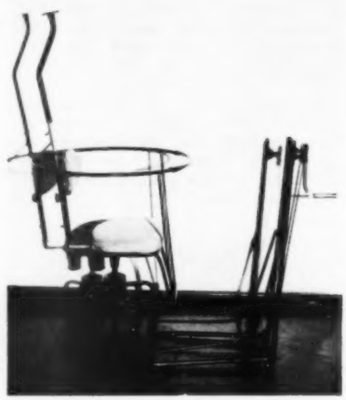
Beaufort, S. C.—A question and a suggestion. When suggestions on matters and equipment pertaining to aviation safety and survival are made through the chain of command or direct to NASC, why are the suggestors not informed of the reason for non-adoption of their ideas? Only by a mutual exchange of ideas can improvements continue to be made in combat readiness and safety. The suggestion is, of course, to inform the person/persons proposing the ideas of the reason for or against adoption.

ROBERT W. BARBER, CAPT
ASO, VMF-122

NASC and APPROACH try to acknowledge all correspondence. Normally NASC is not the action agency on such materials—most of them going to BuWeps—so your question should be directed to action commands. If you have specific letters sent to NASC on which you have not received an acknowledgement, you may write APPROACH informally or direct an official letter to the Commander.

Build Barany Chair

Moffett Field—Aviators attending the VA-122 Instrument Refresher Course may now experience vertigo at its best (or worst depending on ones point of view) due to the efforts of LT S. A. Coakley, an instructor at the school. Working with LT D. E. Darnell, the squadron Flight Surgeon, LT Coakley



The "Coakley Disorientation Simulator" was built in the squadron metal shop for a price of slightly over $100. The chair allows ground school instructors at the Pacific Fleet SPAD School Instrument Training Department to demonstrate the sensations of vertigo to students attending the course.

has come up with a homemade improvement on the Barany Chair.

Starting with an office typist's chair LT Coakley took his idea to the squadron metal shop where D. W. Badger, AMS2, and P. E. Keil, AOCA, built the "Coakley Disorientation Simulator." The chair is driven by a hand crank-pulley arrangement which gives the handle a 2:1 ratio. A simple circular bar which parts to allow entry into the chair and snaps back onto place keeps the subject in the chair during demonstrations yet allows freedom of motion to develop various effects.

The chair, believed to be the most efficient yet produced, gives the school the advantage of refamiliarizing aviators with the effects of vertigo and spatial disorientation. It is used during the classroom session devoted to flight physiology and disorientation.

H. R. TAYLOR, LT

• It sure is refreshing to see this type of ingenuity in attacking a serious problem that is still with us. By exposing the pilot to the sensations of vertigo it is assured he will be somewhat more aware of the problem.

Rescuer's Testimonial

Sanford, Fla.—In reference to LT. J. D. Taylor's letter, Aug. 62 Headmouse column, I would like to add my comment if I may:

On a previous tour of duty I was assigned to a HUP-2 as rescue crewman and SAR duty and I can honestly say that if it hadn't been for the *bright orange* flight suit and the *bright day glow* hard hat there would be a few less pilots today. These are the only reasons they were spotted and picked up.

I can see the LT's point about bright colors in a combat zone. I have been in the Navy long enough to know that if and when the combat question arises, the Navy has a way of always taking care of its own.

J. M. SWEENEY, ADJ2 P/P
VAH-3, NAS, Sanford, Fla.

Busiest Airspace in the U.S.

Pensacola—Trying to guess the area of greatest air traffic density over the United States, most people would pick New York, Los Angeles or Chicago.

The answer is none of these. The Pensacola area leads all the rest. On a typical busy day last year, according to a recently completed FAA study, there were 113,656 minutes of military flying, 469 minutes of air carrier flying and 3072 minutes of general aviation aerial activity there.

The figures dwarf the number two and three areas in air traffic density. The second most densely traveled piece of airspace—the Los Angeles-San Diego area—showed 25,051 minutes of military flying, 1336 by air carriers and 25,518 by general aviation aircraft.

New York was the area of third heaviest density, with 15,668 minutes of military flying, 12,450 by air carriers and 35,672 clocked by general aviation.

Some 96 percent of the aircraft over the Pensacola region are military, mostly Navy planes from a training base complex and Air Force aircraft operating out of two bases.

CNATRA

Metal Caps Suggested

MCAS, Beaufort, N.C.—While troubleshooting the afterburner system of an F8U aircraft, after a new igniter valve was installed, it was found to have a piece of plastic cap, cardboard and wrapping paper plugging up the hole in the fitting. A plastic cap is installed to protect the fitting but the valve must have been dropped.

I would suggest that metal caps be used to seal fittings.

SSGT JAMES E. PITTS

Cold Weather Pamphlets

FPO-San Francisco—We too in BURTON ISLAND are extremely interested in cold weather and arctic survival training material. Our normal crew and the small helicopter detachment carried on board can greatly benefit from such training. The material listed in Oct 1962 APPROACH has been ordered except for the two Sense Pamphlets "Aleutian Sense" and "Arctic Sense." Could you inform me how and where to order these publications? From the enclosed photograph it can be seen that we can benefit from this material.

F. H. RADLOFF, LCDR
Executive Officer

• In response to yours and similar requests from LT P. W. McDaniel, Argentia, LTJG E. Alvarez, VA-144 and others, Sense Pamphlets are available from your nearest Aero-Pubs Division, ref. NavSandA Publication 2002. See your Flight Surgeon or Medical Officer for BuMed publications.

Knife Location

Whidbey Island—This squadron carries the survival knife in a zipper canvas pocket which is sewn to the flight suit on the outboard side of the right leg midway between the knee and the thigh. The pocket is sewn on the left side for left handed persons.

This location has proven to be both comfortable and accessible. There have been no reported instances of interference with other equipment during bailout drills.

We do carry in a pocket on the right shoulder a four-inch long, orange colored, switch blade knife which has a hook shaped (shroud cutter) blade on one end. This shroud cutter blade is carried in the open position in the pocket. This knife has been obtained by open purchase and is worn in addition to the survival knife.

E. E. WOOD
Aviation Safety Officer
VAH-123

• More on knife locations page 39.

Chaplain's Pitch

Ream Field, Calif.—When Admiral White (CFSD/NABs-11) presented the CNO safety plaque to HU-1, the ceremony was very impressive but the part that caught the attention of all was the Chaplain's (LCDR W. N. Detrich, CHC) pitch. It's a change from much of the safety writings these days.

C. E. SMITH, LCDR,
ASO NAS NORTH ISLAND

"O God, our father, we pause to give thanks for Thy concern and interest in each man in HU-1. We are reminded that much of the sorrow, death, loneliness and frustration in the world is due to man's carelessness, one man's neglect, another's lack of responsibility. It is with grateful hearts, then, that we lay before Thee the achievements of this squadron which for the third time is recognized by our Navy and our government as consisting of men who have been concerned enough for each other to practice the way of safety—the practical, brotherly way of putting the Golden Rule to practice in living and working together. God bless each one present. Amen"

School Dates

The schedule of classes for the Aviation Safety School conducted at the University of Southern California is listed below. For additional information concerning the course refer to BuPers Notice 1520 dated 2 May 1962.

Class 42	9 Jan—6 Mar 1962
Class 43	12 Mar—8 May 1963
Class 44	14 May—11 Jul 1963

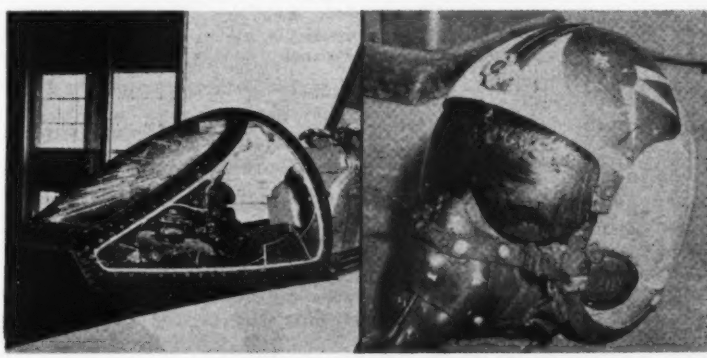
NATOPS Note

All NATOPS Manuals and changes thereto are presently printed and distributed by the U. S. Navy Tactical Doctrine Development and Production Activity. NTDDPA requests that orders for additional manuals or requests for inclusion on distribution lists be addressed directly to:

NTDDPA
Bldg 200-1, W3S
U. S. Naval Station
(Navy Yard Annex)
Washington 25, D. C.

NTDDPA further requests to be made "info" or "copy to" on all traffic and correspondence relative to proposed NATOPS Manual changes, revisions, or review conferences.

AS ONE BIRD TO ANOTHER



ARE YOU WEARING YOUR VISOR DOWN?

This recent bird strike, at 500 feet/330 kts. on a low-level navigation flight, could have been fatal to the pilot. Commanding Officer's Comment: "The policy of this command has been and shall be continually reiterated that visors shall be down on all flights. Proximity to the ground increases the potential hazard of bird strikes and the import of utilizing all items that contribute to pilot safety."

CHATRA AVIATION SAFETY OFFICE

NavWeps 00-75-510

approach

THE NAVAL AVIATION SAFETY REVIEW

VOL. 8 NO. 7

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Commander, NASC

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Pg. 19, 20: Diagrams and photo courtesy Kaman Aircraft Corp.

Pg. 31, 32: Charts courtesy Douglas Aircraft Corp.

Pg. 39: Photos (top left and bottom left) courtesy Grumman Aircraft Corp.

Flight Operations

1 The CCA Story
by LCDR Martin Goode

6 Standard Procedures

8 Read 'Em or Weep
by Ralph McCreadie

13 Creative Brainpower
by CDR R. L. Bothwell

18 Over the Mountains

19 Chopper Controls
by Charles (Les) Morris

22 Story of a Miracle

28 Lance Sterling Does It Again
by LCDR J. J. Schneider

50 Isolated Case

Aero-Medical

30 High Altitude Breathing
by Lester Carlyle

38 A Place for Everything

45 Dear Doc

46 Full Pressure Suits in Perspective
by LCDR N. K. Combs

Maintenance

52 Quality Control in the Parachute Loft
by F. M. Sullivan, PRCS

Departments

16 Op Notes

24 Anymouse

26 Headmouse

36 Notes from Flight Surgeon

57 Notes and Comments on Maintenance

59 Murphy's Law

60 Letters

Inside Back Cover: Lift and Drag

Our product is safety, our process is education, and our profit is measured in the preservation of lives and equipment and increased mission readiness.

Hindsight is Dandy, But Foresight Saves Crunches!

In the business of investigating and reporting aircraft accidents, we find ourselves frequently acting as "Monday morning quarterbacks"—telling everyone what *should* have been done to prevent the accident that *did* happen!

All of this restrospection is necessary, of course, in order that we can increase our knowledge and perhaps prevent a recurrence of a similar accident, but it would be real great if we could apply all of the corrective action *before* the accident!

This is really not so far-fetched as it might sound. No one can argue with the fact that all of the elements which combined to cause the accident existed *before* the loud crunch itself. Of course the time element enters the picture in that some of the cause factors perhaps were not present until immediately prior to the accident, but on the other hand, too often material conditions or personal factors exist long enough beforehand that effective preventive action can be taken *IF* someone, somewhere has enough imagination and foresight to see the danger signs, and *do something about it!*

This is true accident prevention, and should be the primary objective of any aviation safety program.

CNAVanTra "Flight Safety Letter"

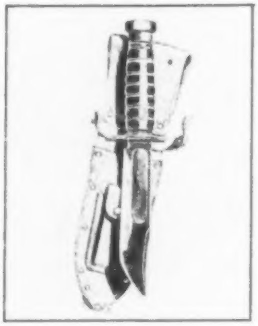
LIFT and DRAG

The CCA Story - Page 1

The advent of CCA gave birth to a new era of night and all weather operational readiness on the part of the attack carrier. Take a look at a smooth operation on the SARA.

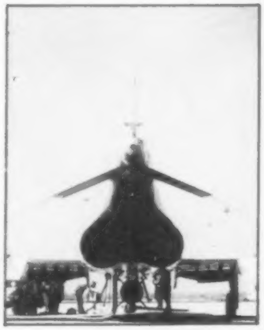
Quality Control in the Parachute Loft - Page 52

Your life may depend upon your emergency equipment—there's no room for an error in its maintenance. Read this author's reasons for insisting Quality Control in the Parachute Loft is a must.



A Place For Everything - page 38

Where to carry your survival knife? Readers everywhere were asked to send in their ideas, photos and sketches. For possible solutions to *your* problems read this one.



Read 'Em or Weep - Page 8

One of the important trouble shooting aids available to you is the engine instrument group in the cockpit. Instruments are the "tools" with which you can analyze malfunctions, make decisions and take action which could save your aircraft and, possibly, even your life!

What's In It For Me? - Page 26

This question comes up most frequently these days. For some interesting discussion of this subject by the gents of the hangar deck, cockpit, admin—on the local level as well as Bureau level—read Headmouse, Letters and Creative Brain Power.